FIRST FIVE-YEAR REVIEW REPORT FOR DUAL SITE GROUNDWATER OPERABLE UNIT MONTROSE CHEMICAL AND DEL AMO SUPERFUND SITES LOS ANGELES COUNTY, CALIFORNIA

Prepared by

US Army Corps of Engineers, Seattle District
for
U.S. Environmental Protection Agency
Region IX
San Francisco, California

September 30, 2015

John Lyons, Acting Assistant Division Director
Superfund Site Cleanup Branch
U.S. Environmental Protection Agency, Region 9

[This page is intentionally left blank.]

Executive Summary

This is the first Five-Year Review of the Dual Site Groundwater Operable Unit (OU) for the Montrose Chemical and Del Amo Superfund Sites located in Los Angeles, California. The purpose of this Five-Year Review is to determine if the remedy is, and will continue to be, protective of human health and the environment. The triggering action for this Five-Year Review (FYR) was the signing of the previous Del Amo FYR on September 24, 2010.

The Montrose Chemical Superfund Site and the Del Amo Superfund Site are located in the "Harbor Gateway" between the Cities of Torrance and Carson. The Harbor Gateway is a half-mile-wide strip of the City of Los Angeles that extends south from Los Angeles proper to Los Angeles Harbor.

The groundwater contamination from both the Montrose Chemical and the Del Amo Superfund Sites has comingled (overlapped), and therefore the United States Environmental Protection Agency (EPA) is addressing the contamination as a single technical problem with a unified remedial strategy called a *dual site operable unit remedy*. EPA refers to the groundwater contamination at the former plant properties collectively as the Dual Site. Overall, groundwater contamination associated with the Dual Site now extends over an area of more than 1.5 miles in length, but its extent differs widely depending on the water-bearing unit being considered.

The Montrose Chemical Corporation of California (Montrose) manufactured technical grade dichloro-diphenyltrichloroethane (DDT) at its former plant from 1947 to 1982. During its 35 years of operation, the Montrose plant released hazardous substances, pollutants, or contaminants into the surrounding environment, including surface soils, surface drainage and storm water pathways, sanitary sewers, the Pacific Ocean, and groundwater. Chlorobenzene and DDT are two of the primary contaminants of concern found in the environment at the Montrose Chemical Site.

The Del Amo facility is a former synthetic rubber manufacturing plant initially owned by the United States War Assets Administration. The War Assets Administration entered into operating agreements with Shell Oil Company (Shell), Dow Chemical Company (Dow), and several other companies, to operate the plant and to produce synthetic rubber for the United States during World War II. In 1955, Shell purchased the facility and began operating it directly. Shell operated the facility until 1972, at which time operations ceased, the plant was dismantled, and the plant buildings were razed. The primary Dual Site contaminants of concern associated the former Del Amo plant property are benzene and ethylbenzene.

On March 30, 1999, EPA issued a ROD for the Dual Site Groundwater to protect long-term human health and the environment. The primary elements of the remedy selected in the ROD:

- Containment zone and isolation of non-aqueous phase liquid (NAPL)
- Plume reduction
- Monitoring
- Institutional Controls
- Additional Data Acquisition

- Treatment and monitoring of para-chlorobenzene sulfonic acid (pCBSA)

This FYR report highlights and discusses a number of concerns about the Dual Site Groundwater Operable Unit and the multi-part remedy selected to address contamination there. First, most elements of the remedy have not yet been implemented. The groundwater extraction and treatment system has been largely constructed, but is not yet operational; in the meantime, existing restrictions are preventing exposure to contaminated groundwater. Overall, the footprints of the chlorobenzene plume, the TCE plume, and pCBSA plume have remained generally stable since the first comprehensive sampling events in 2004 and 2006. Benzene distribution and concentrations within the TI zone appear to be decreasing, suggesting that benzene is biodegrading in the shallowest groundwater units. In the deeper groundwater units outside the TI zone, the remedy selected for benzene plume reduction is active extraction and treatment; the existing groundwater extraction and treatment system, however, may not capture the benzene in these areas. There have also been several locations within the plumes where groundwater samples have reflected unexplained, rapid increases or decreases in contaminant concentrations.

Certain exposure assumptions, toxicity values, and groundwater standards identified in the ROD have since changed. One central concern stems from the fact that the ROD did not address the possibility of vapor intrusion. EPA is currently evaluating that risk: EPA has sampled over 107 residences in the neighborhood above and adjacent to the Montrose Chemical and Del Amo Sites, and found exceedances of indoor air screening levels. Based on the information available, it appears that vapor intrusion does not pose an urgent risk.

Vapor intrusion was not well understood at the time of the ROD, and the potential for vapor intrusion from the shallower groundwater units was therefore not fully evaluated. The delineation of the TI Waiver Zone were established solely on the basis of EPA's conclusion that it would be technically impracticable to achieve MCLs (maximum contaminant levels for drinking water) in the presence of high NAPL concentrations, and not on possible human health risks from vapor intrusion.

In some instances, groundwater standards have changed since issuance of the ROD. Three chemicals – chloroform, ethylbenzene and 1,2,4-trichlorobenzene – now have lower California MCLs than in 1999. For these contaminants, the groundwater cleanup standard selected in the ROD is outside the acceptable cancer risk range of 10^{-6} and 10^{-4}, and, therefore, protectiveness may be affected. The remedy also did not select a cleanup standard for Tertiary-Butyl Alcohol (TBA), a contaminant now found at the Dual Site.

Another set of concerns focuses on the injection of pCBSA. The ROD identifies California's Anti-Degradation Policy as an applicable requirement for the selected remedy, but the ROD did not explicitly include an analysis of possible degradation due to injection of pCBSA, as the policy requires. An Anti-Degradation Policy analysis should therefore be conducted before the groundwater treatment system starts full operation.

In 2015, California's Office of Environmental Health Hazard Assessment (OEHHA) re-evaluated its earlier toxicity assessment for pCBSA using the same toxicity studies available at the time of the 1999

ROD, and arrived at a recommendation for a public health protective concentration of 3,000 µg/L. EPA's Superfund Technical Support Center reviewed OEHHA's reassessment, concluded that OEHHA's reassessment was "not reliable" and determined that there is still insufficient information to determine a screening provisional reference value for pCBSA.

The issues identified in this Five-Year Review are summarized in Section 8. Recommendations to address those issues, and a schedule by which they should be implemented, are set forth in Section 9.

The groundwater remedies at the Dual Site Groundwater Operable Unit of the Montrose Chemical and Del Amo Superfund Sites are currently protective of human health and the environment. There is no exposure to contaminated groundwater, and the recent preliminary investigation of vapor intrusion did not indicate that vapor intrusion from the Dual Site groundwater is an urgent risk. EPA is continuing its vapor intrusion investigation. Benzene appears to be biodegrading, although more data is needed before a more definitive determination can be made. However, to be protective in the long term, the groundwater extraction and treatment system needs to start full operation; the TI zone needs to be reassessed in the context of a potential vapor intrusion pathway; and the need for an active groundwater extraction and treatment system for benzene needs to be evaluated. The following additional issues need to be addressed to ensure long-term protectiveness: the adequacy of the monitoring well network, the need for additional information about the toxicity of pCBSA, development of a comprehensive area-wide coordination and cleanup strategy, and changes to MCLs and toxicity information.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Dual Site Groundwater Operable Unit (Montrose Chemical and Del Amo Superfund Sites)		
EPA ID: CAD008242711 and CAD029544731		
Region: 9	**State:** CA	**City/County:** Los Angeles, Los Angeles County

SITE STATUS	
NPL Status: Final	
Multiple OUs? Yes	**Has the site achieved construction completion?** No

REVIEW STATUS
Lead agency: EPA **If "Other Federal Agency" was selected above, enter Agency name:** Click here to enter text.
Author name (Federal or State Project Manager): Raymond Chavira
Author affiliation: EPA Region 9
Review period: November 2014 – September 2015
Date of site inspection: June 19, 2015
Type of review: Statutory
Review number: 1
Triggering action date: September 24, 2010
Due date *(five years after triggering action date)*: September 24, 2015

Five-Year Review Summary Form (continued)

Issues/Recommendations				
Issues and Recommendations Identified in the Five-Year Review:				
OU(s): Dual Site Groundwater OU	**Issue Category: Changed Site Conditions**			
	Issue: The potential for a vapor intrusion pathway in the residential neighborhood south of the Del Amo Site has not been fully assessed.			
	Recommendation: Collect soil vapor and possibly additional indoor air samples to further assess the potential for a vapor intrusion pathway. All historical and recent soil vapor and indoor air data should be evaluated.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	EPA	EPA	Early 2017
OU(s): Dual Site Groundwater OU	**Issue Category: Changed Site Conditions**			
	Issue: The criteria for selecting the Technical Impracticability Zone did not include the potential for vapor intrusion from groundwater.			
	Recommendation: Complete the vapor intrusion assessment, and consider whether the TI Waiver Zone remains protective in light of any potential vapor intrusion risk.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	EPA	EPA	2018
OU(s): Dual Site Groundwater OU	**Issue Category: Monitoring**			
	Issue: The current Dual Site groundwater monitoring network is not sufficient to adequately characterize the full extent of the Dual Site contaminants, including para-chlorobenzene sulfonic acid (pCBSA).			
	Recommendation: Install additional groundwater monitoring wells to track full extent of all Dual Site contaminants to the non-detect level in all aquifer units. Evaluate the need for sentinel wells to provide additional data on the migration of pCBSA outside the chlorobenzene dissolved plume.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRPs	EPA	2017
OU(s): Dual Site Groundwater OU	**Issue Category: Monitoring**			
	Issue: A unified Conceptual Site Model (CSM) has not been developed for the Dual Site. The CSMs for the Montrose Chemical and Del Amo Sites differ, and hydrogeologic interpretations developed for other facilities in the area are not consistent with the conceptual hydrogeology at the Dual Site.			
	Recommendation: The CSM should integrate the differing Montrose and Del Amo conceptual hydrogeologic models, integrate CSMs developed for other facilities, include sources of contamination in the vicinity of the Dual Site, include production pumping, and identify potential receptors and mutual effects of production pumping and remedial activities.			

Affect Current Protectiveness	Affect Future Protectiveness	Implementing Party	Oversight Party	Milestone Date
No	Yes	PRPs	EPA	2017
OU(s): Dual Site Groundwater OU	**Issue Category: Remedy Performance**			
	Issue: The last production well survey was conducted in 2003. The ROD requires an updated well survey every five years.			
	Recommendation: Prepare an updated well survey for the Dual Site and include all potential vertical conduits.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRPs	EPA	2016
OU(s): Dual Site Groundwater OU	**Issue Category: Remedy Performance**			
	Issue: The Dual Site Groundwater Extraction and Treatment System (GWETS) is not operational and groundwater contamination is not being remediated, with numerous consequences, including: a. the dissolved plume is continuing to migrate into clean or less contaminated water units, and potentially including those used for drinking water; and b. potential exposure risks via the vapor intrusion pathway are not being abated.			
	Recommendation: Continue to work toward achieving operational status of the GWETS to contain and remediate the Dual Site COCs.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP/EPA/State	EPA	2016
OU(s): Dual Site Groundwater OU	**Issue Category: Remedy Performance**			
	Issue: Upgradient groundwater contaminated with chlorinated solvents (mainly TCE) continues to migrate into the dissolved plume and comingle with Dual Site contaminants.			
	Recommendation: Isolate and hydraulically contain TCE source areas to attain the goals of the ROD. Implement additional data collection and groundwater investigations to better characterize the TCE plume distribution (ROD, page 11-15). As necessary, design and construct groundwater containment system(s) to prevent further migration of TCE as outlined in the performance based approach in the ROD (11-25, 26).			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP/EPA/State	EPA	2018
OU(s): Dual Site Groundwater OU	**Issue Category: Remedy Performance**			
	Issue: Groundwater cleanup work overseen by agencies other than EPA at multiple source areas near the Dual Site may interfere with effectiveness of the remedy.			
	Recommendation: A multi-site strategy should be developed to ensure effective coordination with other agencies.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	EPA/State	EPA	2016

OU(s): Dual Site Groundwater OU	Issue Category: Remedy Performance			
	Issue: Under the ROD, intrinsic biodegradation is the remedy for benzene in the UBF and MBFB. The effectiveness of biodegradation cannot be fully evaluated from the data collected to date.			
	Recommendation: Collect and report additional lines of evidence such as geochemical and physiochemical groundwater quality parameters as part of the Monitoring Aquifer Compliance Plan or other plans to evaluate the effectiveness of intrinsic biodegradation.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRPs	EPA	2017

OU(s): Dual Site Groundwater OU	Issue Category: Remedy Performance			
	Issue: The ROD selected active extraction/reinjection for dissolved-phase benzene in the area outside the TI zone in the MBFC and Gage. The GWETS, when operational, may not capture all of that benzene.			
	Recommendation: Determine whether the GWETS will capture the benzene in the MBFC and Gage. If not, design and implement active hydraulic extraction and treatment of benzene.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRPs	EPA	2017

OU(s): Dual Site Groundwater OU	Issue Category: Changed Site Conditions			
	Issue: The toxicity information and/or MCLs for chloroform, ethylbenzene, and 1,2,4-trichlorobenzene have changed since the ROD was issued.			
	Recommendation: Reevaluate the protectiveness of the ROD's groundwater cleanup standards for chloroform, ethylbenzene, and 1,2,4-trichlorobenzene.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	EPA	EPA	2017

OU(s): Dual Site Groundwater OU	Issue Category: Remedy Performance			
	Issue: The ROD contemplates migration of pCBSA due to reinjection. The ROD or the underlying FS therefore should have included an analysis of that migration, consistent with California's Anti-Degradation Policy.			
	Recommendation: Complete an Anti-Degradation Policy analysis for migration of pCBSA.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	EPA	EPA	2016

OU(s): Dual Site Groundwater OU	Issue Category: Changed Site Conditions
	Issue: Tertiary-Butyl Alcohol (TBA) has been detected in several wells. The ROD did not include TBA as a contaminant of concern or select an ISGS for TBA, and therefore no remedial component has been designed or implemented to address it.
	Recommendation: Consider whether protectiveness of the selected remedy requires adoption of a cleanup standard (ISGS) for TBA.

Affect Current Protectiveness	Affect Future Protectiveness	Implementing Party	Oversight Party	Milestone Date
No	Yes	EPA	EPA	2019
OU(s): Dual Site Groundwater OU	**Issue Category: Changed Site Conditions**			
	Issue: Reporting limits for some COCs are greater than the ISGS value, impeding EPA's ability to assess compliance with the ROD.			
	Recommendation: Revise sampling plans to include analysis procedures that can achieve lower reporting limits below the ISGS.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	2016

Protectiveness Statement

Operable Unit:	*Protectiveness Determination:*	*Addendum Due Date (if applicable):*
Dual Site Groundwater OU	Short-term Protective	Click here to enter date.

Protectiveness Statement:

The groundwater remedies at the Dual Site Groundwater Operable Unit of the Montrose Chemical and Del Amo Superfund Sites are currently protective of human health and the environment. There is no exposure to contaminated groundwater, and the recent preliminary investigation of vapor intrusion did not indicate that vapor intrusion from the Dual Site groundwater is an urgent risk. EPA is continuing its vapor intrusion investigation. Benzene appears to be biodegrading, although more data is needed before a more definitive determination can be made. However, to be protective in the long term, the groundwater extraction and treatment system needs to start full operation; the TI zone needs to be reassessed in the context of a potential vapor intrusion pathway; and the need for an active groundwater extraction and treatment system for benzene needs to be evaluated. The following additional issues need to be addressed to ensure long-term protectiveness: the adequacy of the monitoring well network, the need for additional information about the toxicity of pCBSA, development of a comprehensive area-wide coordination and cleanup strategy, and changes to MCLs and toxicity information.

Contents

List of Figures

List of Tables

List of Abbreviations

AOC	Administrative Order on Consent
ARAR	Applicable or Relevant and Appropriate Requirements
BHC	benzene hexachloride
CD	Consent Decree
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	contaminant of concern
CWSC	California Water Service Company
DCE	dichloroethylene
DDT	dichloro-diphenyltrichloroethane
DDW	State Water Resources Control Board, Division of Drinking Water
DNAPL	dense non-aqueous phase liquid
DTSC	California Department of Toxic Substances Control
ESD	Explanation of Significant Differences
EPA	Environmental Protection Agency
FBR	fluidized bed reactor
FYR	Five-Year Review
GAC	granular activated carbon
GSA	U.S. General Services Administration
HQ	hazard quotient
IRIS	Integrated Risk Information System
ISGS	In-Situ Groundwater Standards
JGWFS	Joint Groundwater Feasibility Study
JGWRA	Joint Groundwater Risk Assessment
LBF	Lower Bellflower Aquitard
LGAC	liquid phase granulated activated carbon
LNAPL	light non-aqueous phase liquid
MBFB	Middle Bellflower “B”
MBFC	Middle Bellflower “C”
MCL	Maximum Contaminant Level
NAPL	non-aqueous phase liquid
NCP	National Contingency Plan
NPL	National Priorities List
OEHHA	California Office of Environmental Health Hazard Assessment
O&M	operation and maintenance
OU	operable unit
pCBSA	para-chlorobenzene sulfonic acid
PCE	tetrachloroethylene
PRG	preliminary risk goal
PRP	potentially responsible party
RAO	remedial action objectives
RI/FS	Remedial Investigation and Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
RSL	Regional Screening Level
RWQCB	Regional Water Quality Control Board

SDWA	Safe Water Drinking Act
TBA	tertiary butyl alcohol
TCA	trichloroethane
TCE	trichloroethylene
THM	trihalomethanes
TI	technically impracticable
UBF	Upper Bellflower
USACE	U.S. Army Corps of Engineers
VI	vapor intrusion
VOC	volatile organic compound

First Five-Year Review Report

for

Dual Site Groundwater Operable Unit at

Montrose and Del Amo Superfund Sites

1. Introduction

The purpose of a Five-Year Review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy will continue to be protective of human health and the environment. The methods, findings, and conclusions of FYRs are documented in five-year review reports. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The U.S. Environmental Protection Agency (EPA) prepares FYRs pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121 and the National Contingency Plan (NCP). CERCLA 121 states:

> "*If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews."*

EPA interpreted this requirement further in the NCP, 40 Code of Federal Regulations (CFR) Section 300.430(f)(4)(ii), which states:

> "*If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such actions no less often than every five years after the initiation of the selected remedial action*."

EPA is the lead agency for developing and implementing the remedy for the Dual Site Groundwater Operable Unit (OU) at the Montrose Chemical and Del Amo Superfund Sites in Los Angeles County, California. The U.S. Army Corps of Engineers (USACE) provided support for this FYR and preparation of this report. The California Department of Toxic Substances Control (DTSC), as the

support agency representing the State of California, has reviewed all supporting documentation and provided input to EPA during the FYR process.

The Dual Site Groundwater OU (Dual Site) addresses groundwater contamination from both the Montrose Chemical and Del Amo Superfund Sites. The selected remedy for the Dual Site includes extraction and treatment of contaminated groundwater, and reinjection of treated water back into groundwater aquifers. This is the first FYR for the Dual Site. The triggering action for this statutory review is the previous FYR (2010) for the Del Amo Superfund Site.

2. Site Chronology

The following table lists the dates of important events for the Dual Site Groundwater OU.

Table 2-1. Chronology of Site Events

Event	Date
Contaminated soil is first discovered at Del Amo during early geotechnical investigations following the Del Amo plant decommissioning.	1970s
The synthetic rubber facility at Del Amo is dismantled and plant buildings razed.	1972
EPA conducts an inspection of Montrose and determines that DDT was present in surface drainages leading from the Montrose property.	1982
EPA and California Regional Water Quality Control Board issue enforcement orders to Montrose.	1983
Montrose demolishes the former plant.	1983
EPA proposes the Montrose Chemical Site for the Superfund National Priorities List (NPL).	1984
Montrose grades and covers most of the property with an asphalt cap.	1984/1985
Montrose and EPA enter into an Administrative Order on Consent (AOC) (EPA Docket No. 85-04) obligating Montrose to perform an RI/FS of the entire Montrose Site.	1985
AOC (EPA Docket No. 85-04) is amended to require an evaluation of the nature and extent of contamination at the Montrose Site.	1987
EPA issues a unilateral administrative order (UAO) to Montrose requiring an asphalt cover on the uncovered southeastern portion of the site (EPA Docket No. 88-10).	1988
EPA adds the Montrose Site to the NPL.	1989
AOC (EPA Docket No. 85-04) is further amended.	1989
EPA recommends the Del Amo Site for the NPL.	1991
Del Amo Respondents Shell and Dow enter into an AOC requiring a remedial investigation/feasibility study (RI/FS) for the Del Amo Site (EPA Docket No. 92-13).	1992

Event	Date
EPA informs Montrose and Del Amo respondents that EPA intends to unite the remedial selection processes for groundwater and initiates a dual-Site feasibility study called the "Joint Groundwater Feasibility Study."	1995
EPA completes the Joint Groundwater Feasibility Study.	1998
EPA issues the Dual Site Groundwater OU ROD.	1999
EPA adds the Del Amo Site to the NPL.	2002
EPA issues remedial design UAOs to Montrose (EPA Docket No. 2003-06) and Shell (EPA Docket No. 2003-08), requiring, among other things, well installation, data acquisition, pilot testing, groundwater monitoring, and groundwater model development.	2003
EPA issues a UAO to Montrose and Shell (EPA Docket No. 2008-04A) to complete the remainder of the remedial design work.	2008
Remedial design for the Dual Site Groundwater OU treatment system begins.	2008
EPA and Montrose enter into a partial consent decree (CD) for construction of a groundwater treatment system for the Dual Site Groundwater Operable Unit.	2012
EPA approves Montrose's Dual Site Groundwater OU Remedial Design Report.	2012
Groundwater treatment plant construction begins.	2013

3. Background

3.1. Physical Characteristics

The Montrose Chemical Superfund Site and the Del Amo Superfund Site are located in the "Harbor Gateway" area of the City of Los Angeles, situated between the cities of Torrance and Carson (see Figure 3-1). The Harbor Gateway is a half-mile-wide strip of the City of Los Angeles that extends south from Los Angeles proper and provides the City a contiguous jurisdiction to Los Angeles Harbor.

The greater area surrounding the former plants contains portions of the cities of Los Angeles, Carson, Gardena, Torrance, and portions of unincorporated Los Angeles County. The area within a 2-mile radius of the Dual Site is fully urbanized, with a residential population living primarily to the north and south of the properties.

Over time, the groundwater contamination from the Montrose and the Del Amo Sites became comingled (overlapped), and EPA therefore chose to address the contamination as a single technical problem with a unified remedial strategy called a *dual site operable unit remedy*. EPA refers to the groundwater contamination associated with the former plant properties collectively as the Dual Site. Overall, groundwater contamination associated with these two sites now extends over an area of more

than 1.5 miles in length, but its extent differs widely depending on the water-bearing unit as well as the lateral location being considered.

3.1.1. Former Montrose Chemical Corporation Plant

The former Montrose Chemical Corporation plant property is located at 20201 S. Normandie Avenue, and occupies a single parcel of approximately 13 acres within the City of Los Angeles. Although not formally located within the boundaries of the City of Torrance, historical documents from the time of the plant's operations refer to the plant as "the Torrance plant." The groundwater treatment system that is part of the cleanup remedy for the Dual Site Groundwater OU is located on the former plant property. Entrance to the property is from Normandie Avenue through a locking gate located in the northeast corner of the property. The on-property features include three large, raised, asphalt building pads (constructed in 1985) and six temporary soil cells containing soil excavated from a historical stormwater pathway in a portion of the nearby residential neighborhood along Kenwood Avenue. Surface water drainage is toward the southeast corner of the Montrose property and the Normandie Avenue Ditch.

3.1.2. Former Del Amo Synthetic Rubber Plant

The former Del Amo Synthetic Rubber plant property occupied an area of approximately 270 acres, and is roughly bounded by South Normandie Avenue on the west, Interstate 110 on the east, 190th Street on the north, and Del Amo Boulevard on the south. The property has since been subdivided and redeveloped for commercial and light industrial enterprises.

3.2. Hydrology

This section provides an overview of the geologic and hydrogeologic features of the region and site.

3.2.1. Regional Geology

The Superfund Site is located within the West Coast Basin of the Torrance Plain. The Basin extends southwesterly along the coast between the Newport-Inglewood Uplift to the Santa Monica Bay. The basin is bounded by two major northwest-trending strike–slip faults that make up the San Andreas zone. The Newport–Inglewood Uplift, to the northeast, is a series of discontinuous faults and folds that form a prominent line of northwest trending hills including the Baldwin Hills, Rosecrans Hills, Dominguez Hills, and Signal Hill. The Palos Verdes Fault forms the Palo Verdes Hills to the southwest.

The stratigraphy of the West Coast Basin includes Quaternary age (less than 1.8 million years old) continental and marine deposits and upper Miocene to lower Pleistocene (less than 15 million years old) marine sediments overlying a basement complex of igneous and metamorphic rocks. Holocene sediments (the last 12,000 years) in the project area consist of poorly consolidated alluvium deposited by the Los Angeles and San Gabriel Rivers. These sediments consist of gravel, sand, silt, and clay. The Holocene alluvium is underlain by more than 1,000 feet of early to middle Pleistocene gravel,

sand, silt, and clay. The early to middle Pleistocene sediments are subdivided into the marine San Pedro Formation and the nonmarine to shallow marine Lakewood Formation. The geologic units of hydrogeologic interest are (in order from oldest to youngest): the Pico Formation; the San Pedro Formation; the Lakewood Formation; and, older dune sand, alluvium, and active dune sand (USEPA, 1998).

Hydrogeologic units in the West Coast Basin include aquitards and aquifers of varying compositions and water-yielding properties. These units, in order from first water encountered to deeper units, include the Upper Bellflower, the Middle Bellflower "B" Sand, the Middle Bellflower "C" Sand, and the lower Bellflower Aquitard, the Gage Aquifer, the Gage-Lynwood Aquitard, the Lynwood Aquifer, the Lynwood-Silverado Aquitard, and the Silverado Aquifer.

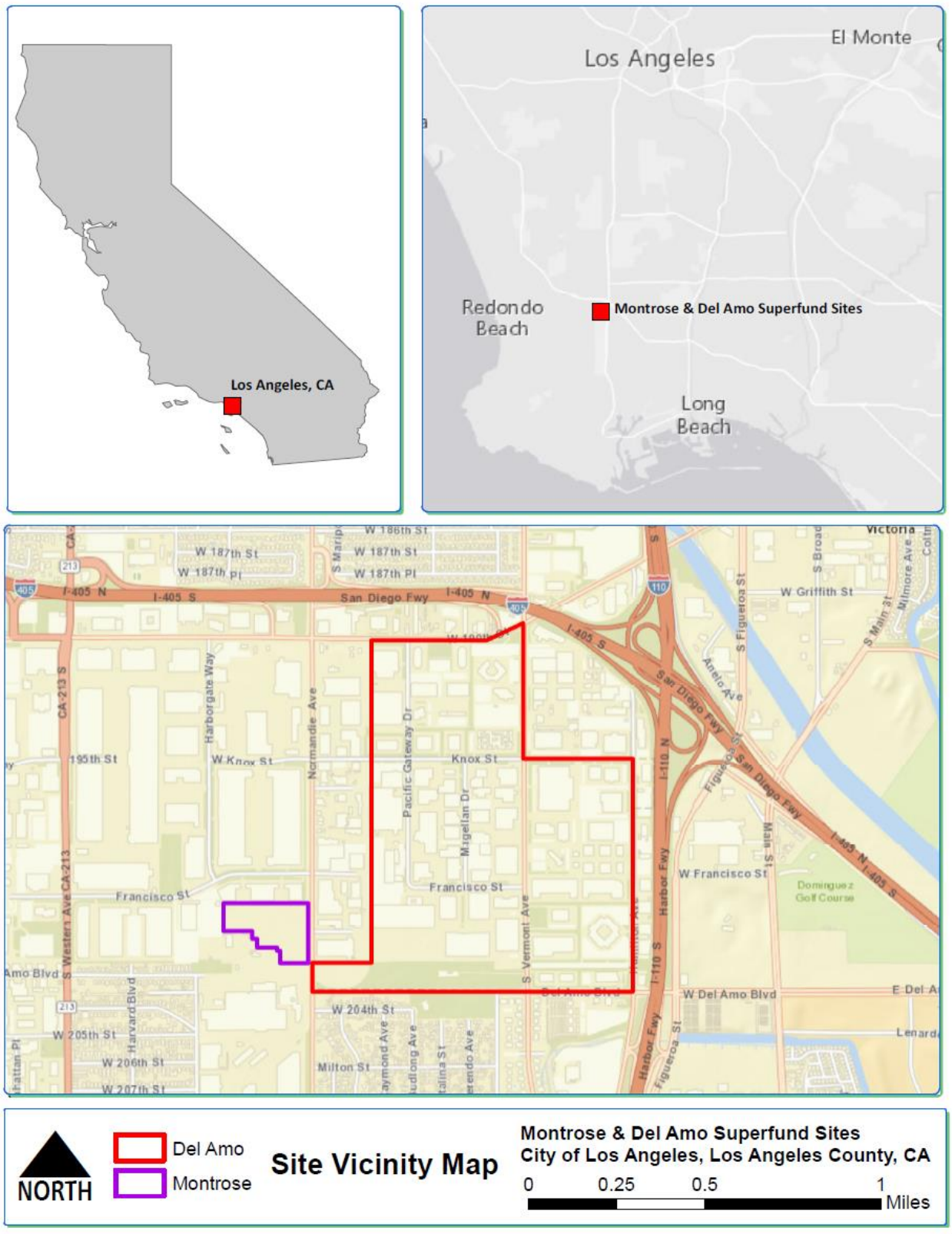

Figure 3-1. Location Map for former Montrose/Del Amo Facilities

3.2.2. Site Hydrogeology

The hydrogeologic units are divided into multiple water-bearing units under the Dual Site Groundwater OU of which five are affected by Dual Site contaminants (see Figure 3-2). These units bear different names in some documents and the aliases are mentioned in the descriptions below. In order of shallowest to deepest, the water-bearing units currently affected by contamination are as follows:

- Upper Bellflower (UBF), also termed Water Table Unit in some reports

The UBF is the uppermost water-bearing unit, and typically occurs from approximately 60 to 105 feet below ground surface (bgs) at the Site. The unit is characterized by interbedded layers of fine-grained sand and silt/clay. The lower portion of the UBF, from approximately 95 to 105 feet bgs, is predominantly composed of silty sand. Groundwater flow direction in the UBF aquifer is generally southwesterly, with a flow velocity of approximately 0.01feet/day or 4.4 feet/year (URS, 2015).

- Middle Bellflower "B" Sand (MBFB Sand)

Documents for the Del Amo site make a distinction between the UBF and the MBFB (URS, 2005), but reports for the Montrose site combined the UBF and MBFB sand into the Bellflower Aquitard and considered the two units to be hydraulically consistent (Hargis+Assoc., 2007). The MBFB consists of fine sand with minor muddy layers and laminations. This unit is present only in the western portion of the Dual Site and has an average thickness of 15 feet that tapers out toward the central portion of the Site. The MBFB flow direction is generally southeasterly, with a flow velocity of approximately 0.07 feet/day or 24 feet/year (URS, 2015).

- Middle Bellflower "C" Sand (MBFC Sand)

The MBFC directly underlies the MBFB sand unit and typically occurs from approximately 105 to 130 feet bgs. The MBFC is predominantly composed of fine-grained sand with increasing grain size towards the bottom of the unit. The MBFC is a confined aquifer with water levels only slightly lower than in the UBF. Groundwater flow in the MBFC is toward the south to south-southeast, with a flow velocity of approximately 0.76 feet/day or 280 feet/year (URS, 2015).

- Gage Aquifer

The Gage aquifer unit underlies the MBFC sand unit and typically occurs from approximately 140 to 200 feet bgs at the Montrose property; the Lower Bellflower Aquitard separates the two aquifer units. The Gage is predominantly composed of fine-grained sand with decreasing grain size towards the bottom of the unit and is relatively homogeneous at the Dual Site. The Gage is a confined aquifer unit with water levels typically 1 to 2 feet lower than in the MBFC. Groundwater flow in the Gage is interpreted to be toward the east Gage-Lynwood Aquitard, with an average flow velocity approximately 0.14 feet/day or 52 feet/year (URS, 2015).

- Lynwood Aquifer

The Lynwood aquifer unit underlies the Gage and typically occurs beginning at a depth of approximately 230 feet bgs. The Gage-Lynwood Aquitard separates the two aquifer units. The upper portion of the Lynwood is predominantly composed of fine to medium-grained sand, while underlying portions are predominantly composed of well-graded sands, gravelly sands, and sandy gravels. The Lynwood is a confined aquifer with water levels approximately 10 feet lower than in the Gage.

The water table occurs in the UBF at most of the Del Amo site, but it occurs in the MBFB Sand at the Montrose Site due to the relative slope of the two units. Water levels in the UBF/Water Table, MBFB, and MBFC are typically within a few feet of each other, while the level in the Gage is typically an additional two to four feet lower than the MBFC. The generally decreasing water levels with depth indicate a downward hydraulic gradient.

The greatest contaminant migration potential exists in the coarser-grained MBFC Sand, Gage Aquifer, and Lynwood Aquifer, because of the relatively higher hydraulic conductivity of these units. These units typically can sustain maximum pumping rates of 50-100 gallons per minute (gpm) per well. The UBF and MBFB Sand are much finer-grained and can typically sustain maximum pump rates in the range of 1 gpm and 10 gpm, respectively, at the Dual Site. The degree of heterogeneity of the UBF and MBFB Sand is high, especially near the former Montrose plant property.

The lateral hydraulic gradient of the groundwater varies locally in the upper units, but is largely consistent in the MBFC Sand and all hydrostratigraphic units beneath it. The direction of groundwater flow in the UBF has local perturbations, but is generally to the south. The groundwater flow direction in the MBFB Sand, MBFC Sand, and Gage Aquifer, is to the south to south/southeast. The groundwater flow for the Lynwood Aquifer is generally east-southeast. The magnitude of the eastward component of the horizontal groundwater flow vector increases slightly as the depth of the unit increases. Under natural gradients (i.e., in the absence of local pumping), the vertical component of the hydraulic gradient is generally downward between all hydrostratigraphic units.

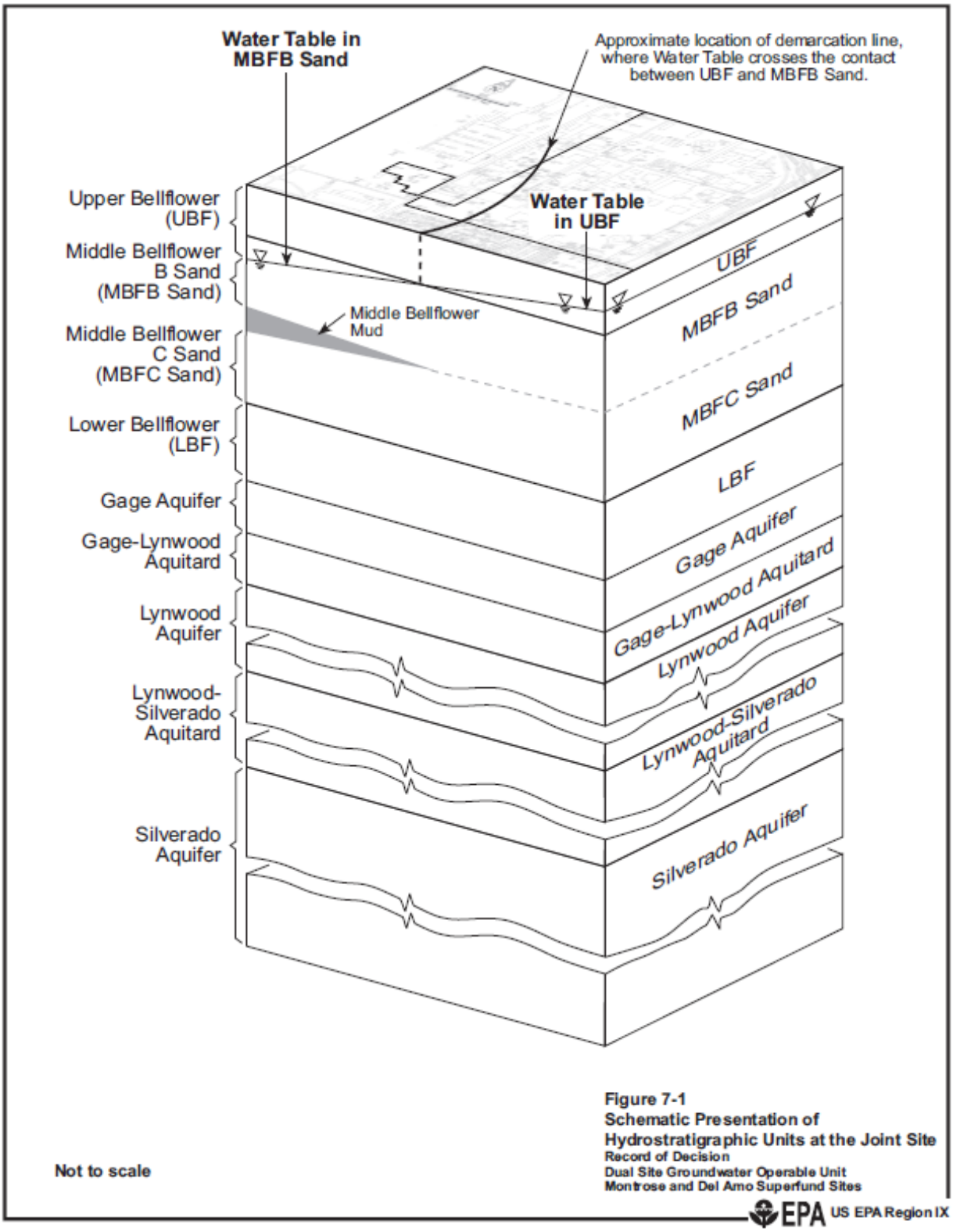

Figure 3-2. Schematic of the Hydrostratigraphic Units at the Dual Site
Source: (USEPA, 1999)

3.3. Land and Resource Use

3.3.1. Land Use and Zoning

Prior to the 1930s, the principal land use in the vicinity of the Dual Site was agricultural. In 1934 the Hughes-Mitchell paint manufacturing plant began operation on the future site of the manufacturing plant operated by Montrose Chemical Corporation of California. By the early 1940s, after drainage of the Dominguez Slough, industry was developing and residential areas were clustering around the farmlands. This development included the Montrose plant property, the Del Amo Synthetic Rubber Plant, the adjacent McDonnell Douglas property, and residential areas to the south and east of the Dual Site (EPA, 1999).

By the 1960s and 1970s, light commerce and industry existed in the Torrance area and in the mid-1970s, the industrial facilities of the Del Amo Superfund Site were subdivided and redeveloped into a business park (EPA, 1999).

Currently, the former Montrose plant property is vacant and covered by a temporary asphalt cap; the property remains zoned for industrial uses. As noted, the former Del Amo facility property has been subdivided, and is zoned for industrial and commercial uses.

The general area surrounding the Dual Site includes industrial, commercial, and residential zoning. The areas directly south of the Del Amo Site and southeast and southwest of the Montrose Site are largely residential and part of unincorporated Los Angeles County. In several instances, both heavy industrial uses and residential land uses exist adjacent to each other and to the former plant properties, particularly in the "patchwork" areas, where Los Angeles County jurisdiction neighbors the Harbor Gateway and the Cities of Torrance and Carson. Active petroleum refineries are operating within several miles to the east and west of the former plant properties.

3.3.2. Groundwater Use and Designations

The State of California designates all of the water-bearing hydrostratigraphic units under the Dual Site as potential drinking water sources. Therefore, EPA selected drinking water standards (maximum contaminant levels, or MCLs) in the ROD to be relevant and appropriate requirements for in-situ cleanup of groundwater at the Dual Site.

There are currently no known municipal water or municipal production wells in use within the area of contaminated groundwater at the Dual Site. EPA also is not aware of any currently used private potable water wells within the contaminated zone. The nearest municipal supply wells are about a mile downgradient of the current leading edge of the chlorobenzene plume in the MBFC Sand. These wells are screened primarily in the Silverado aquifer, though some may be screened in the Lynwood Aquifer. The Silverado Aquifer is the most extensively used water bearing unit for municipal supply purposes in the southern west coast groundwater system. This aquifer occurs at approximately 450 feet below land surface near the Dual Site. There are a number of other private and industrial wells within a mile of the plume. None of these are located within the current contaminant distribution of the Dual

Site. The Dual Site is part of an adjudicated groundwater basin originally created to reduce salt water intrusion problems which were occurring in the 1960s. Production wells near the Dual Site are shown on Figure 3-3.

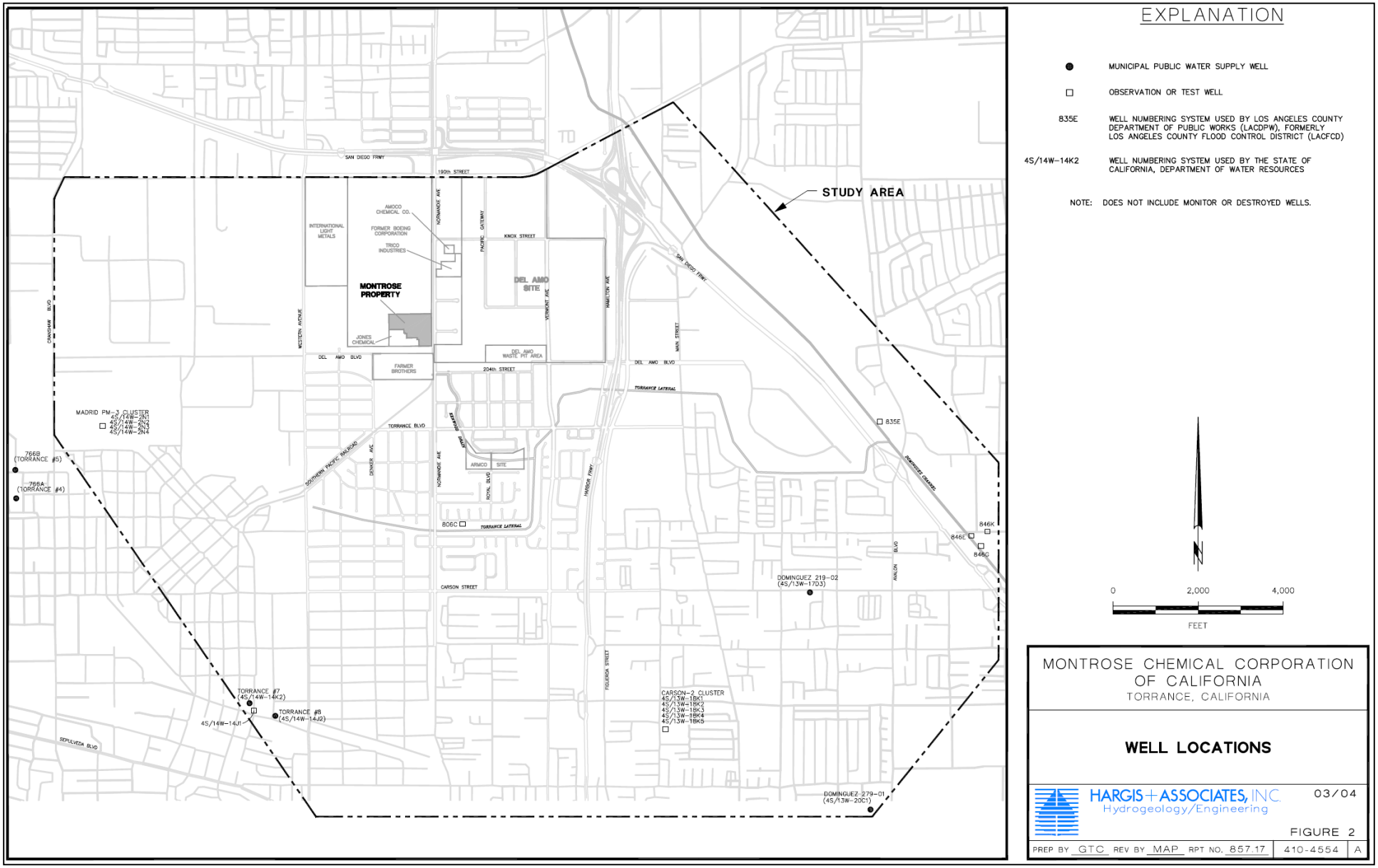

Figure 3-3. Wells of Record within 2-Mile Radius of the Dual Site Groundwater OU

3.4. History of Contamination

3.4.1. Montrose Chemical Superfund Site

The Montrose Chemical Corporation manufactured dichloro-diphenyltrichloroethane (DDT) at the site from 1947 to 1982. Technical grade DDT was one of the most-widely used pesticides in the world until 1972, when the use of DDT was banned in the United States for most purposes. After 1972, Montrose continued producing DDT at the former plant to be sold in other countries. In 1982, the plant completely ceased operations, and by 1983, it was fully dismantled and demolished. During 1984 and 1985, Montrose graded and covered the property with asphalt.

During its 35 years of operation, the Montrose plant released hazardous substances, pollutants, or contaminants into the surrounding environment, including surface soils, surface drainage and storm water pathways, sanitary sewers, the Pacific Ocean, and groundwater. The primary raw materials Montrose used for making DDT were chlorobenzene and trichloroacetaldehyde. These chemicals were placed in batch reactors in the presence of a powerful sulfuric acid catalyst called oleum. The resulting chemical reaction produced DDT.

These operations included a series of trenches used to convey wastes and a waste disposal pond which received wastewaters, DDT, and chlorobenzene. This pond also received caustic liquors and acid tars. Activities at the plant caused discharges of chemicals to the ground surface and to the waste pond. The soils under the Central Processing Area of the former Montrose plant contain large quantities of chlorobenzene in dense non-aqueous phase liquid (DNAPL) form, as well as chlorobenzene dissolved in groundwater.

Chlorobenzene and DDT are two of the primary contaminants found in the environment at the Montrose Site. Another contaminant associated with the Montrose Site is the highly water-soluble compound para-chlorobenzene sulfonic acid (pCBSA). This unwanted by-product of DDT manufacture was created when chlorobenzene was directly sulfonated by sulfuric acid in Montrose's operations.

The Montrose plant also periodically discharged contaminants from the Montrose plant into the storm water pathway, which, until the late 1960s, was an unlined drainage ditch running through what became a residential neighborhood. Some of these discharges may have resulted in additional groundwater contamination: where significant quantities of contaminated water pooled and stagnated over time, that water could have traveled through the soils to contaminate groundwater by recharge.

In 1982, EPA conducted an inspection of the Montrose property and determined that DDT was present in surface drainages leading from the Montrose property. In 1983, EPA and the California Regional Water Quality Control Board issued an enforcement order to Montrose, requiring them to cease and desist their discharge of hazardous wastes to the storm drain and surface water.

On October 15, 1984, EPA proposed adding the Montrose Site to the National Priorities List (NPL). The Site was listed final on the NPL on October 4, 1989.

3.4.2. Del Amo Superfund Site

The Del Amo facility is a former synthetic rubber manufacturing plant initially owned by the United States War Assets Administration (this former federal agency was succeeded by the U.S. General Services Administration (GSA)). The War Assets Administration entered into operating agreements with Shell Oil Company (Shell), Dow Chemical Company (Dow), and several other companies to operate the plant and to produce synthetic rubber for the United States during World War II. In 1955, Shell purchased the facility and began operating it directly. Shell operated the facility until 1972, at which time operations ceased, the plant was dismantled, and the plant buildings were razed.

The Del Amo plant had three sub-plants within it, commonly called "plancors." The layout of the former plant is presented in Figure 3-4. The styrene and butadiene plancors produced styrene and butadiene, respectively, and the rubber plancor chemically combined styrene and butadiene to make synthetic rubber. Of the three plancors, it has been shown that the majority of the contamination is found in the area of the former styrene plancor, in which large quantities of liquid benzene and ethylbenzene were stored and used. Over the years of its operation, the Del Amo plant released hazardous substances, pollutants, or contaminants into the surrounding environment. There are, at a minimum, eleven areas at the former Del Amo plant, nine of which are in the styrene plancor, that were under investigation at the time of the 1999 ROD as sources of benzene light non-aqueous phase liquid (LNAPL) to the subsurface.

The Del Amo Site was listed final on the NPL on September 7, 2002.

3.4.3. Other Contaminant Sources

In addition to the former Montrose and Del Amo plants, there are several sources of benzene and/or chlorinated solvents (e.g., trichloroethylene (TCE), tetrachloroethylene (PCE), and dichloroethylene (DCE)) within the Dual Site. The former Montrose plant is the only known source of chlorobenzene, DDT, and pCBSA to groundwater at the Dual Site. The additional benzene and chlorinated solvent sources are listed below with the likely primary contributing contaminant in parentheses. *This section is intended to provide background information and does not necessarily identify all such sources.*

- **Petroleum transmission pipelines (benzene).** A series of petroleum transmission pipelines, unrelated to the former Montrose and Del Amo plants, have been and still are used to transfer petroleum products from the port to refineries in the area. There are several locations directly under these pipelines where groundwater concentrations are indicative of the presence of benzene LNAPL, which may be related to these pipelines.

- **The JCI Jones Chemicals, Inc. plant (TCE, PCE, DCE, and benzene).** This plant manufactures bleach and sells other chemical products in bulk and has been in operation immediately south of the former Montrose plant since the mid-1950s. Based on investigations by EPA and the State of California, Jones Chemicals is known to have discharged chlorinated solvents to a dry well on their property. Likewise, there are fuel tanks which may have leaked petroleum products into the subsurface. Jones Chemicals also stored PCE on its property in bulk,

packaged PCE in drums, and sold PCE for a number of years. Jones Chemicals also operated a drum facility which is a likely source of chlorinated aliphatic solvents released to the subsurface.

- **Solvent-handling facilities (TCE, PCE).** There are facilities near 196th Street at the western border of the former Del Amo plant which have handled chlorinated solvents and have soils with significant concentrations of these solvents. The relevant operations at these facilities occurred or continue to occur subsequent to the closure of the Del Amo plant.

- **McDonnell Douglas/Trico/Amoco (TCE).** These historical facilities were located north and northeast of the former Montrose plant property. Groundwater beneath these facilities is impacted with chlorinated volatile organic compounds (VOCs), primarily TCE.

- **International Light Metals (TCE).** This facility is located northwest of the Montrose. Groundwater beneath this facility is impacted with chlorinated VOCs, primarily TCE.

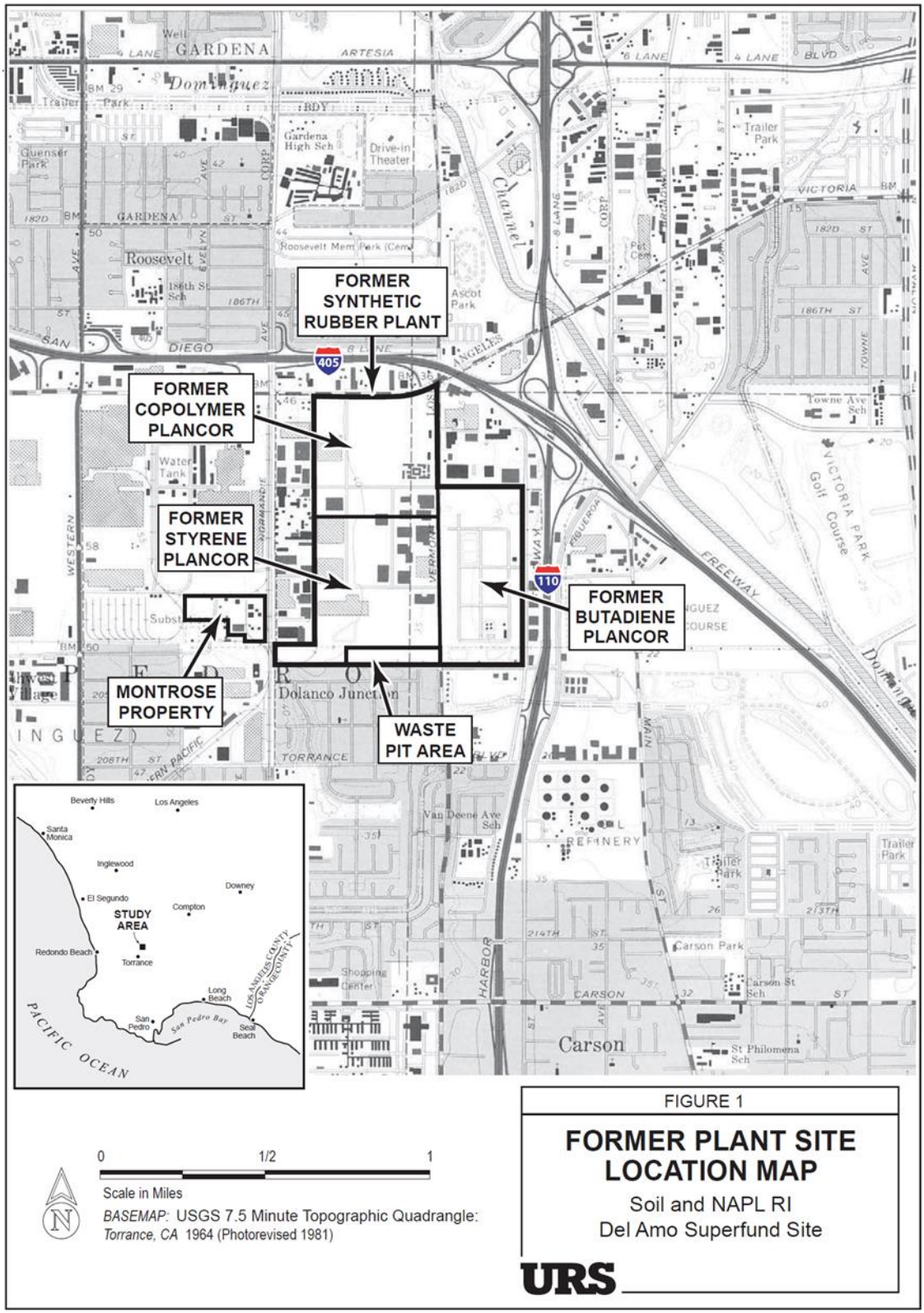

Figure 3-4. Former Del Amo Plant Layout

3.5. Initial Response

3.5.1. Montrose Chemical Superfund Site

EPA began a remedial investigation of the Montrose Chemical Site under CERCLA in the early 1980s. Without prior approval of EPA, Montrose demolished the former plant and then graded the property, covering it with an asphalt cap, in 1984 and 1985.

On October 28, 1985, Montrose and EPA entered into an Administrative Order on Consent (AOC) (EPA Docket No. 85-04), which obligated Montrose to perform a remedial investigation and feasibility study (RI/FS) of the entire Montrose Site. The AOC was subsequently amended twice, once in 1987 and again in 1989. Montrose installed groundwater monitoring wells in four separate water bearing units, installed onsite NAPL wells, drilled and sampled from soil borings on and near the former plant property, and performed a number of other investigation-related tasks. In January 1998, pursuant to the provisions of the AOC, EPA took back from Montrose the remaining work to complete the RI report.

3.5.2. Del Amo Superfund Site

In May 1992, EPA, Shell, and Dow entered into an AOC (EPA Docket No. 92-13) which required Shell and Dow (acting as "Del Amo Respondents") to perform an RI/FS for the Del Amo site, including the entire 270-acre former plant site. A separate RI report for the Del Amo site groundwater was finalized in May 1998.

3.5.3. Dual Groundwater Remedial Effort

By 1995, sufficient data had been obtained from the Del Amo groundwater investigation to determine that (1) groundwater contamination from the two sites had commingled, and (2) the evaluation of remedial alternatives related to groundwater at one site was inseparable from the same evaluation at the other site. Groundwater contamination at both sites had to be considered together in order to properly evaluate and select groundwater alternatives for the two sites.

At that point, EPA initiated a process to generate a single feasibility study, called the Joint Groundwater Feasibility Study (JGWFS). The JGWFS was released for public comment on June 26, 1998, and was finalized upon issuance of the 1999 Dual Site Record of Decision (ROD).

3.6. Basis for Taking Action

The principal threat at the Dual Site Groundwater OU is the NAPL – both LNAPL, primarily benzene from Del Amo, and DNAPL, primarily chlorobenzene from Montrose. The NAPL continually and slowly dissolves into the groundwater, creating a large distribution of dissolved phase contamination in excess of health-based standards. Also, the NAPL itself may move to greater depths.

There is no known current exposure pathway for humans to make contact with the contaminated groundwater. If there were, however, EPA has determined that the health risk posed by the contaminated

groundwater at the Dual Site would be unacceptable. Dissolved contamination may arrive to deeper units either by: (1) dissolved contamination migrating downward from/through the shallower units, or (2) NAPL migrating directly to the deeper unit followed by dissolution into the deeper unit. Dissolved contamination also moves outward laterally in the most affected groundwater units. Because of the large extent of existing contamination and this potential migration, this contaminated water may eventually be used by humans, may migrate and reach existing wells that are being used for groundwater or reach locations that are the site for future wells, and destroy the usability of the groundwater resource.

At the time of the ROD, more than 30 hazardous substances, pollutants, and contaminants were detected in groundwater at the Dual Site including: chlorobenzene, benzene, ethylbenzene, dichlorobenzene, naphthalene, DDT, BHC, chloroform, TCE, PCE, DCE, pCBSA, and trichloroethane (TCA). Of these, however, benzene, chlorobenzene, pCBSA, TCE and PCE are by-far the most widely distributed, consistently detected, and are found in the highest concentration in the Dual Site Groundwater OU.

These factors provided the basis for taking remedial action under CERCLA.

4. Remedial Actions

4.1. Remedy Selection

EPA issued a ROD for the Dual Site Groundwater OU on March 30, 1999.

4.1.1. Remedial Action Objectives

The remedial objectives in the 1999 ROD are set forth in Section 9.2 of the ROD:

1. Where technically practicable, reduce the concentrations of contaminants in Dual Site groundwater to in-situ groundwater standards (ISGS);

2. In areas of groundwater where attainment of ISGS levels is not technically practicable, contain contaminants within their current lateral extent and depth;

3. Isolate NAPL by surrounding it with a zone of groundwater from which dissolved phase contaminants cannot escape;

4. Prevent lateral and vertical migration of dissolved phase contaminants at concentrations greater than ISGS levels to areas where currently they are not present or are below ISGS levels; and

5. Protect current and future uses of groundwater from exposure to Dual Site groundwater contaminants at concentrations above ISGS levels.

The ROD addresses remediation for three main plumes of contaminants of concern: chlorobenzene, TCE, and benzene. The TCE plume refers to chlorinated organic compounds, which include TCE, PCE, DCE, and TCA.

4.1.2. Remedy Description

The lateral and vertical extent of the three main plumes of groundwater contamination at the Dual Site is shown in Figure 4-1. The ROD defined the plumes as follows at Section 7.2:

- ***Chlorobenzene Plume***: This plume includes the entire distribution of chlorobenzene in groundwater at the site and all other contaminants that are commingled with the chlorobenzene. Benzene, TCE, PCE, and a variety of other contaminants are present within the chlorobenzene plume. This plume is present in the MBFB Sand, the MBFC Sand, and the Gage Aquifer, the Gage-Lynwood Aquitard, and the Lynwood Aquifer.
- ***Benzene Plume***: This plume includes the portion of the distribution of benzene in groundwater at the site that is not commingled with chlorobenzene; i.e., benzene is present within the chlorobenzene plume, but the term "Benzene Plume" refers to benzene located outside of the chlorobenzene plume. The benzene plume includes ethylbenzene and naphthalene, among other contaminants. This plume is present in the UBF, the MBFB Sand, and the MBFC Sand.
- ***TCE Plume***: This plume includes the portions of the distributions of any such contaminants in groundwater at the site that are not commingled with the chlorobenzene plume. As noted above the TCE plume includes PCE, DCE, and TCA. This plume is present in the UBF, the MBFB Sand and the MBFC Sand. The TCE plume is commingled with the benzene plume in the UBF and the MBFB Sand. The TCE plume in the MBFC Sand lies under the benzene plume in the MBFB Sand and north of the benzene plume in the MBFC Sand.

Remedy Components

The remedy components include containment and isolation of NAPL, plume reduction, pCBSA remedial action, monitoring, additional data acquisition, and institutional controls. The following paragraphs summarize the ROD requirements for each of these components. An analysis of these components can be found in Section 6 of this FYR.

Containment zone and isolation of NAPL

The ROD established a containment zone, defined as a zone of contained dissolved phase contamination in groundwater surrounding the NAPL. The containment zone isolates NAPL and prevents the dissolved contamination from the NAPL from further contaminating the groundwater outside of the zone.

In selecting a remedy, EPA determined that it would be technically impracticable to attain ISGS levels *inside* of the containment zone, because the NAPL continues to dissolve into the groundwater within the zone. This zone is also called the TI Waiver Zone (See Figure 4-2). A technical impracticability (TI) waiver waives the requirement to meet the groundwater cleanup standards *within* the containment zone.

At the time of the ROD, there were no technologies which had been proven to be capable of removing all NAPL from large sites where NAPL is widely distributed laterally and vertically, and where stratigraphy is highly heterogeneous and complex. At Montrose, DNAPL has migrated downward to depths exceeding 130 feet below ground surface and occurs in discontinuous layers. The 1999 ROD, at Section 10.2, described in detail the basis for EPA's determination that NAPL areas cannot be restored to drinking

water standards. Montrose is continuing, under EPA oversight, to evaluate the properties and distribution of DNAPL, and evaluate options for removing some DNAPL. In September 2014, EPA issued a proposed plan describing the proposed cleanup of DNAPL and requesting public comment.

The containment methods selected in the ROD for dissolved phase contaminants in each plume are summarized in Table 4-1.

Table 4-1. Plume Containment and Reduction Methods

Plume	Containment and Reduction Method
Chlorobenzene	Hydraulic extraction[1], treatment[2], and discharge via aquifer injection
Benzene (UBF and MBFB Sand)	Intrinsic biodegradation
Benzene (MBFC Sand and Gage)	Hydraulic extraction[1], treatment[2], and discharge[3]
TCE	Hydraulic extraction[1], treatment[4], and discharge[3]

1 – Hydraulic extraction is achieved by pumping groundwater up via numerous extraction wells.
2 – Treatment technologies considered for chlorobenzene and benzene are adsorption including liquid phase granulated activated carbon (LGAC); air stripping plus LGAC polishing; circulating fluidized bed reactor (FBR) plus LGAC.
3 – Discharge for the benzene and TCE plume includes discharge to the storm sewer or via aquifer injection. Aquifer injection will be allowed only if total dissolved solids are low enough to meet regulatory and engineering requirements for this type of injection.
4 – Primary treatment technologies to be considered for the TCE plume are adsorption including LGAC and air stripping plus LGAC.

Plume Reduction

Outside of the containment zone, all contaminated groundwater exceeding ISGS is to be remediated, such that contaminant concentrations are reduced to below ISGS levels. The ISGS are presented in Table 4-2. The ROD describes methods for plume reduction for each plume; these methods are the same as those selected for plume containment and are summarized in Table 4-1.

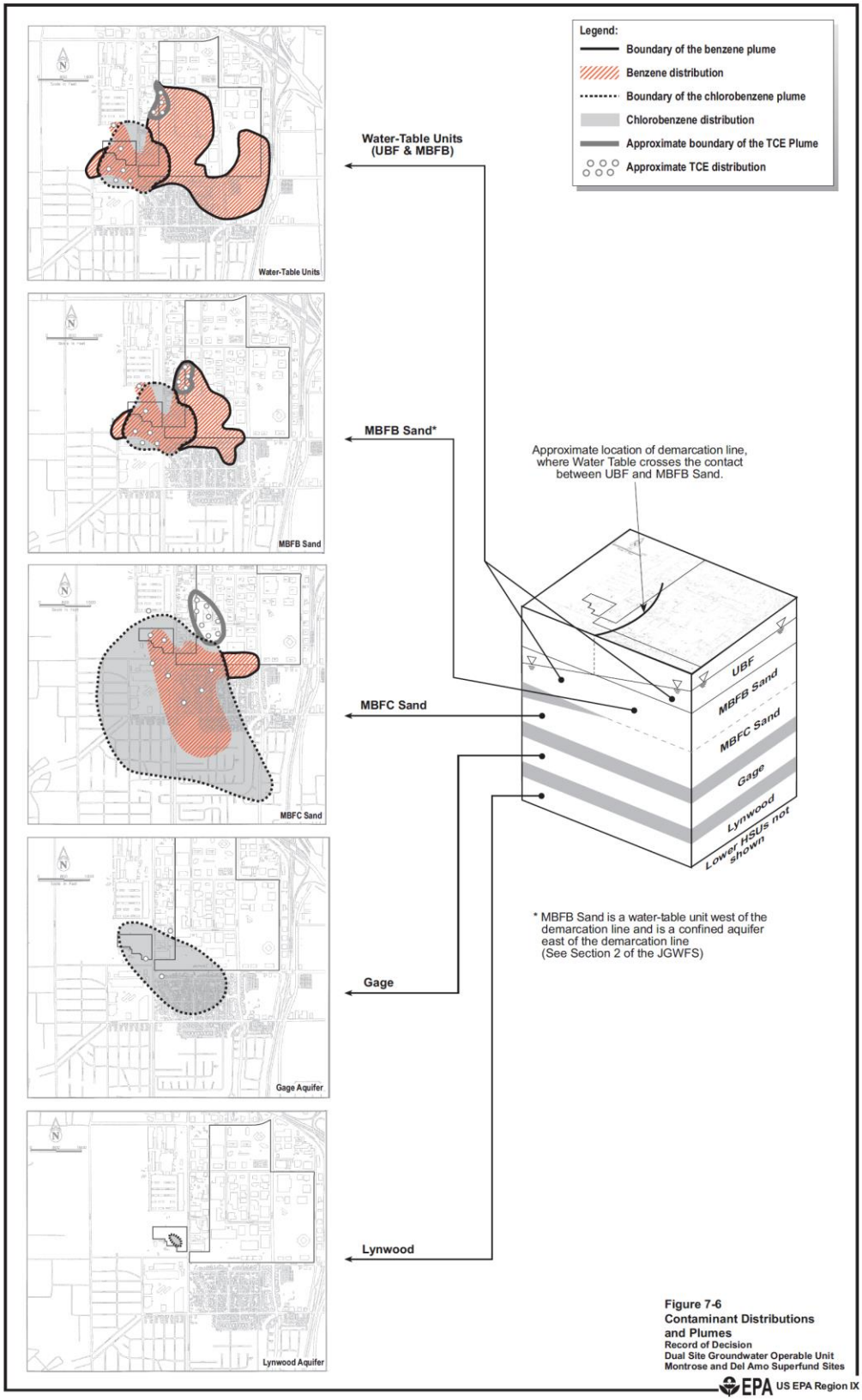

Figure 4-1. Contaminant Plumes, as identified in the 1999 ROD
(Source: EPA 1999)

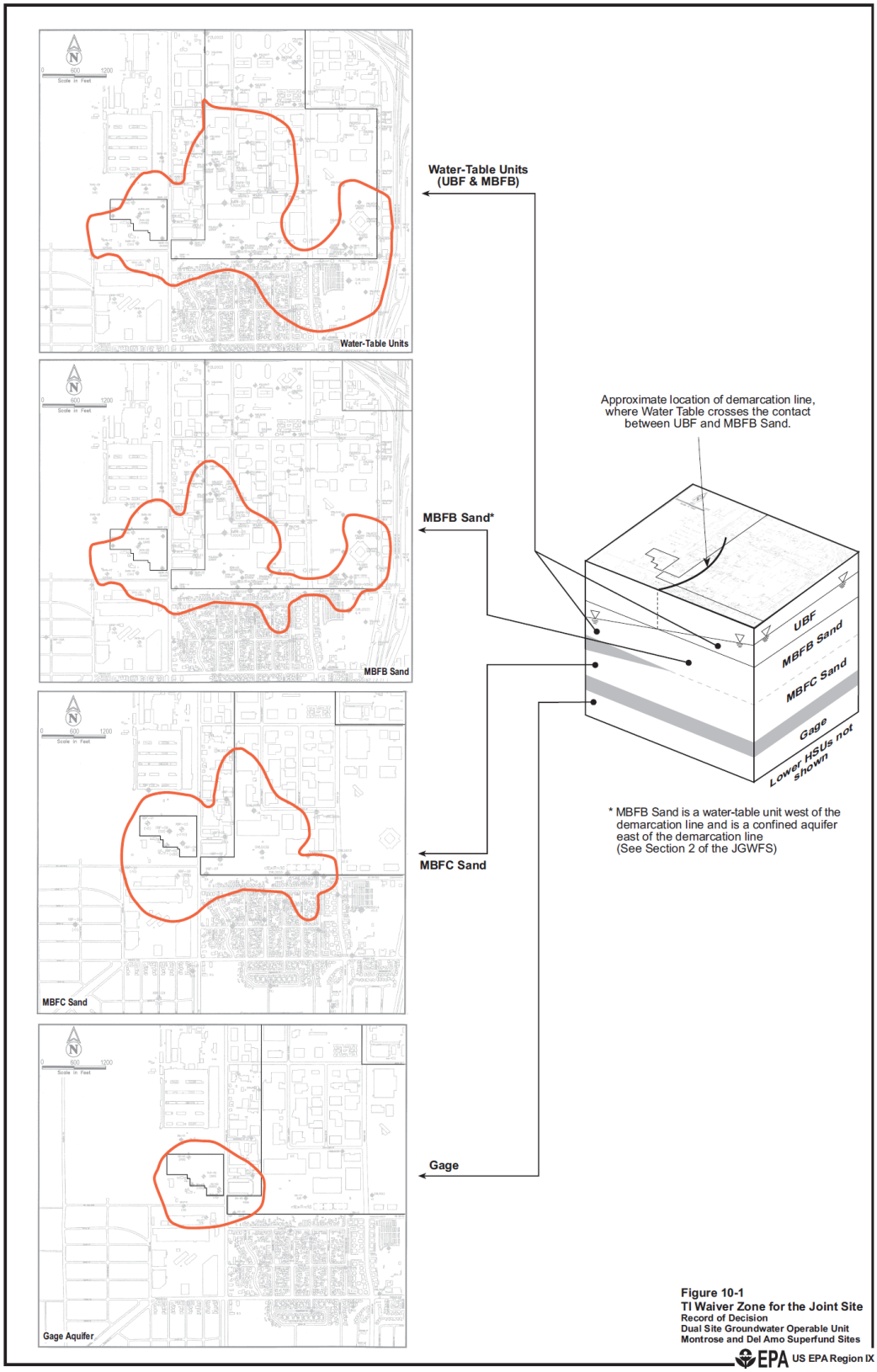

Figure 4-2. TI Waiver Zone, as delineated in the 1999 ROD
(Source: EPA 1999)

pCBSA Remedial Actions

In addition to the three plumes, the ROD addresses another Dual Site-related contaminant in the groundwater, pCBSA. Although pCBSA is not identified as a contaminant of concern for the Dual Site i.e., not requiring cleanup, the ROD prescribes that the remedial action accomplish the following with respect to pCBSA:

- The concentration at which pCBSA is re-injected into the ground shall be limited to 25,000 parts per billion (ppb). This requirement is a non-promulgated standard of the State of California; it is selected by the ROD as a performance standard for injected groundwater.
- The full downgradient extent of pCBSA contamination shall be determined and the movement of pCBSA shall be routinely monitored.
- Sampling at potentially susceptible public production wells shall include analyses for pCBSA.
- Well surveys shall be routinely updated to identify any new wells which may lie within the pCBSA distribution.
- As part of each five-year review, EPA will re-evaluate whether additional toxicological studies have been performed for pCBSA, assess the extent of the pCBSA plume, and make determinations as to whether the remedy remains protective with respect to pCBSA.

Monitoring

Monitoring per the ROD will be conducted to address the following objectives:

- Confirm that contaminants have not left the containment zone;
- Determine if contaminant concentrations above ISGS levels are being reduced;
- Determine lateral and vertical movement of contaminants within the containment and plume reduction zones;
- Determine groundwater levels, hydraulic gradients, groundwater contour maps, effects of any local pumping both on and off the Dual Site, drawdowns, and groundwater flow velocities within all hydrostratigraphic units;
- Assess the effectiveness and performance of the treatment system;
- Determine the continued reliability of intrinsic biodegradation to contain the benzene plume in the UBF and MBFB sand;
- Determine the extent of pCBSA to assess its proximity to production wells and evaluate aquifer injection effects; and
- Monitor production wells nearest in proximity to the downgradient toe of the pCBSA distribution.

Additional Data Acquisition

The ROD required additional data to be collected including:

- Data sufficient to further identify TCE sources within the Dual Site and to characterize the exact extent of their distribution;
- Data to further characterize the benzene plume in the MBFB Sand under the butadiene plancor of the former Del Amo plant; and
- Data to further characterize the downgradient extent of the pCBSA plume.

Institutional Controls

The ROD describes the following institutional controls:

Continue existing restrictions. EPA will coordinate with the appropriate agencies regarding the existing legal and regulatory prohibitions and restrictions on groundwater use for the affected groundwater at the Dual Site.

Non-interference orders. EPA will issue administrative non-interference orders to appropriate parties to prevent contaminant sources outside the Dual Site from interfering with the remedial action.

Well surveys. The ROD states that wells surveys will be performed to monitor groundwater use within the area of groundwater affected by contamination at the Dual Site. As part of each statutorily-required 5-year review of the remedial action, and at other times as determined necessary by EPA, a well survey shall be performed for (1) the area where groundwater contamination exists at concentrations exceeding ISGS levels, (2) the area in which pCBSA concentrations exist at detected concentrations, and (3) the area within one-quarter mile of the areas described in (1) and (2). The wells surveys shall identify public or private wells which exist, whether or not they are in operation. The well survey shall be a public record on file with EPA Region 9.

In addition, wells identified in this survey that were not previously identified shall be sampled upon EPA's receipt of permission of access to the real property. Results shall be made available to the well owner and to any property owner who requests these results. Analytes for this sampling shall include the COCs for the Dual Site, including pCBSA.

If results show that concentrations exceed ISGS levels or if pCBSA is found at any concentration, the following is to occur.

- EPA shall inform the users and owners of the well the findings, health risks that may be associated with used of the water, and if appropriate, provide recommendations to the user as to how to avoid or eliminate those risks.
- EPA shall inform the State Department of Health Services, the State Department of Toxic Substances Control (DTSC), the Regional Water Quality Control Board, and the Office of the Watermaster of the findings and ask that these agencies review the case of the well to determine

if actions under these agencies authorities can be used to prevent further exposure to contaminated water.

- EPA may issue non-interference orders, at its discretion, to prevent or limit operation of wells which may be found to exist within the contaminated groundwater at the Dual Site in the future.

In-Situ Groundwater Standards

The groundwater outside of the containment zone must attain the following in-situ groundwater standards (ISGS), which are the lower of the State or federal Maximum Contaminant Levels (MCL) as established under the Safe Drinking Water Act. For contaminants that do not have MCLs, the ISGS shall be EPA's Tap Water Preliminary Remediation Goals (1994 goals), which are based on the lower of a 10^{-6} cancer risk or a non-cancer hazard index of 1 for residential exposure assumptions. As described above, EPA has determined that attainment of these levels is not technically practicable in the Containment Zone (TI Waiver Zone). The ISGS are presented in Table 4-2.

Table 4-2. In-Situ Groundwater Standards, from Table 9-1 of the 1999 ROD

Compound	1999 Federal MCL (µg/L)	1999 State MCL (µg/L)	EPA 1998 Tap Water PRGs (µg/L) (Listed only when Federal or State MCLs do not exist)	ISGS [1] (µg/L)
Acetone	-	-	610	610
Acrolein	-	-	0.042	0.042
Acrylonitrile	-	-	3.7	3.7
Aldrin	-	-	0.004	0.004
Alpha-BHC	-	-	0.011	0.011
Benzene	5	1	-	1
Beta-BHC	-	-	0.037	0.037
Beta-Endosulfan	-	-	220	220
Bromoform	100	100	-	100
Bromomethane	-	-	8.7	8.7
Di-n-Butyl phthalate	-	-	3700	3700
sec-Butylbenzene	-	-	61	61
Carbon Disulfide	-	-	1,000	1,000
Carbon Tetrachloride	5	0.5	-	0.5
Chlorobenzene	100	70	-	70
Chloroethane			8600	8600
Chloroform	100	100	-	100
Chloromethane	-	-	1.5	1.5
2-Chlorophenol	-	-	38	38
Cyclohexane	-	-	-[2]	350 [2]

Compound	1999 Federal MCL (µg/L)	1999 State MCL (µg/L)	EPA 1998 Tap Water PRGs (µg/L) (Listed only when Federal or State MCLs do not exist)	ISGS [1] (µg/L)
DDD (total)	-	-	0.28	0.28
DDE (total)	-	-	0.20	0.20
DDT (total)	-	-	0.20	0.20
1,2-Dichlorobenzene	600	600	-	600
1,3-Dichlorobenzene	-	-	17	17
1,4-Dicholorobenzene	75	5	-	5
Dichlorobromomethane	100	100	-	100
1,1-Dichloroethane	-	5	-	5
1,2-Dichloroethane	5	0.5	-	0.5
1,1-Dichloroethene	7	6	-	6
cis-1,2-Dichloroethene	70	6	-	6
trans-1,2-Dichloroethene	100	10	-	10
1,2-Dichloropropane	5	5	-	5
Diethylphthalate	-	-	29,000	29,000
Endrin	2	2	-	2
Ethylbenzene	700	700	-	700
Freon 11	-	150	-	150
Freon 12	-	-	390	390
Gamma-BHC	0.2	0.2	-	0.2
Heptachlor	0.4	0.01	-	0.01
Heptachlor epoxide	0.2	0.01	-	0.01
2-Hexanone	-	-	160[4]	160[4]
Isopropylbenzene	-	-	61	61
Methyl Ethyl Ketone	-	-	1900	1900
4-Methyl-2-Pentanone	-	-	160	160
Methylene Chloride	5	5	-	5
2-Methylnaphthalene	-	-	-[3]	6.2 [3]
Naphthalene	-	-	6.2	6.2
Pentachlorophenol	1	1	-	1
Phenol	-	-	22,000	22,000
n-Propylbenzene	-	-	61	61
Styrene	100	100	-	100
1,1,2,2-Tetrachloroethane	-	1	-	1
Tetrachloroethene	5	5	-	5

Compound	1999 Federal MCL (µg/L)	1999 State MCL (µg/L)	EPA 1998 Tap Water PRGs (µg/L) (Listed only when Federal or State MCLs do not exist)	ISGS [1] (µg/L)
Toluene	1,000	150	-	150
1,2,4-Trichlorobenzene	70	70	-	70
1,1,1-Trichloroethane	200	200		200
1,1,2-Trichloroethane	5	5	-	5
Trichloroethene	5	5	-	5
1,2,4-Trimethylbenzene	-	-	12	12
Vinyl Acetate	-	-	410	410
Vinyl Chloride	2	0.5	-	0.5
Xylenes (total)	10,000	1,750	-	1,750

NOTES:

1: The In Situ Groundwater Standard for each chemical detected is the more stringent of the federal and state MCL where these exist. Solely for chemicals with no state or federal MCL promulgated, the ISGS is the EPA May 7, 1998 tap water PRG.

2: There is no MCL or PRG available for cyclohexane. The ISGS value is based on the PRG for n-Hexane, which is used as a surrogate compound for cyclohexane.

3: There is no MCL or PRG available for 2-Methylnaphthalene. The ISGS value is based on the PRG for naphthalene, which is used as a surrogate compound for 2-Methylnapthalene.

4: There is no MCL or PRG available for 2-Hexanone. The ISGS value is based on the PRG for Methyl Isobutyl Ketone, which is used as a surrogate component for 2-Hexanone

2-4: Toxicological surrogate compounds would be expected to have similar toxicological properties to the compounds in question. The three contaminants noted were not consistently detected, do not present in a discernible distribution, and provide an insignificant portion of mass and volume of groundwater contamination, as well as the risk posed by the Dual Site groundwater.

4.2. Remedy Implementation

Groundwater Treatment System

Operation of the groundwater treatment system is an integral part of the containment and plume reduction components of the remedy. The remedial design for the groundwater treatment was completed on September 19, 2012. The main components of the treatment system include extraction wells to extract contaminated groundwater, plate air strippers to treat extracted groundwater, vapor-phase Granular Activated Carbon (GAC) to treat vapor from the air strippers, liquid-phase GAC to treat any residual contamination from the groundwater treated by the air strippers, an advanced oxidation reactor (HiPOx) to treat pCBSA, and injection wells to reinject treated groundwater into the Gage aquifer to minimize vertical movement from the upper zones to the Lynwood Aquifer.

In March 2013, construction of the groundwater treatment plant began. Construction activities included the drilling of eight new extraction wells and three new injection wells, and the installation of underground piping that will transport water to and from the treatment plant.

By December 2014, all components of the groundwater treatment system were built and installed. Functional testing of the system components began in November 2014, using clean water to confirm successful installation and operability of treatment plants pumps, throughput, and control and alarm systems. The early testing revealed that the air blower for the air stripper unit could not operate at the design air flow of 5200 cubic feet per minute (cfm), and could only achieve a maximum air flow rate of 3500 cfm.

Functional testing continued in December using groundwater from the extraction wells to verify that the system could meet reinjection standards, as required in the ROD and Remedial Design. The testing included sampling of groundwater at various points in the treatment train: after the HiPOx unit, after the air stripper, and at the vapor effluent stack (the VGAC system). The two testing runs in December showed that the VGAC and LGAC operate as designed. However, effluent samples from the HiPOx unit did not consistently achieve the 25,000 µg/L performance standard for pCBSA (results were 23,000 µg/L and 31,000 µg/L), or the 70 µg/L chlorobenzene standard after the Air Stripper Unit (results were 53 µg/L and 110 µg/L). The HiPOx unit was unable to achieve the minimum design ozone dosage of 23.7 mg/L for one of the two tests.

On February 26, 2015, a third short-term functional test was conducted with the HiPOx unit set to its maximum ozone dose. The HiPOx unit was not able to achieve an ozone doze of 27.3 mg/L, the maximum design dose required in the Remedial Design. Also, the unit again failed to reduce the pCBSA concentration in the effluent to the reinjection standard of 25,000 µg/L. One contributing factor to this failure is that the influent pCBSA concentrations for the three functional tests (51,000 µg/L, 55,000 µg/L, 48,000 µg/L) were significantly above the design assumption (39,600 µg/L). Subsequent groundwater sampling indicated that the pCBSA concentration at an on-property extraction well had significantly increased from 76,000 to 630,000 µg/L, causing the combined influent pCBSA concentration to climb above the level assumed in the design.

Between March 2015 and July 2015, the HiPOx unit was tested, repaired and analyzed to determine why the full range of ozone could not be achieved. In July, it was determined that the oxygen concentrator component of the HiPOx system was not supplying sufficient oxygen concentration to produce the maximum required dosage of 27.3 mg/L. To date, the maximum sustainable dosage with the current system is 26.1 mg/L.

Proposed modifications to the Air Stripper and the HiPOx units to ensure that the treatment plant will operate as designed will be submitted. The final planned element of the functional testing, referred to as "Phase II," will test the reinjection component of the remedy. This testing has not yet been performed.

Monitoring

A comprehensive groundwater monitoring event was conducted in October 2006 to collect data to provide site-wide delineation of the chlorobenzene plume and of pCBSA. Seventy-two monitoring wells were sampled. A supplemental groundwater monitoring event occurred in April 2009 which identifies the pCBSA distribution in the Bellflower and Gage aquifers. Monitoring was conducted in 2012 to evaluate changes in the hydraulic gradients and dissolved chemical concentrations since the last comprehensive

monitoring events in 2006 and 2009. More recent groundwater monitoring was conducted in 2014 to establish a baseline for contaminants of concern including pCBSA prior to startup of the groundwater extraction and treatment system and a 2nd baseline groundwater sampling event is underway and planned for completion in October 2015.

The results of groundwater monitoring conducted to date, including the distribution of pCBSA, will be discussed in Section 6.4.

Institutional Controls

Implementation of institutional controls is discussed in Section 6.7.

pCBSA

Groundwater monitoring was conducted in 2006, 2009, 2012, and 2014 to determine the extent of pCBSA in groundwater. Additional discussion is presented in Section 6.4.

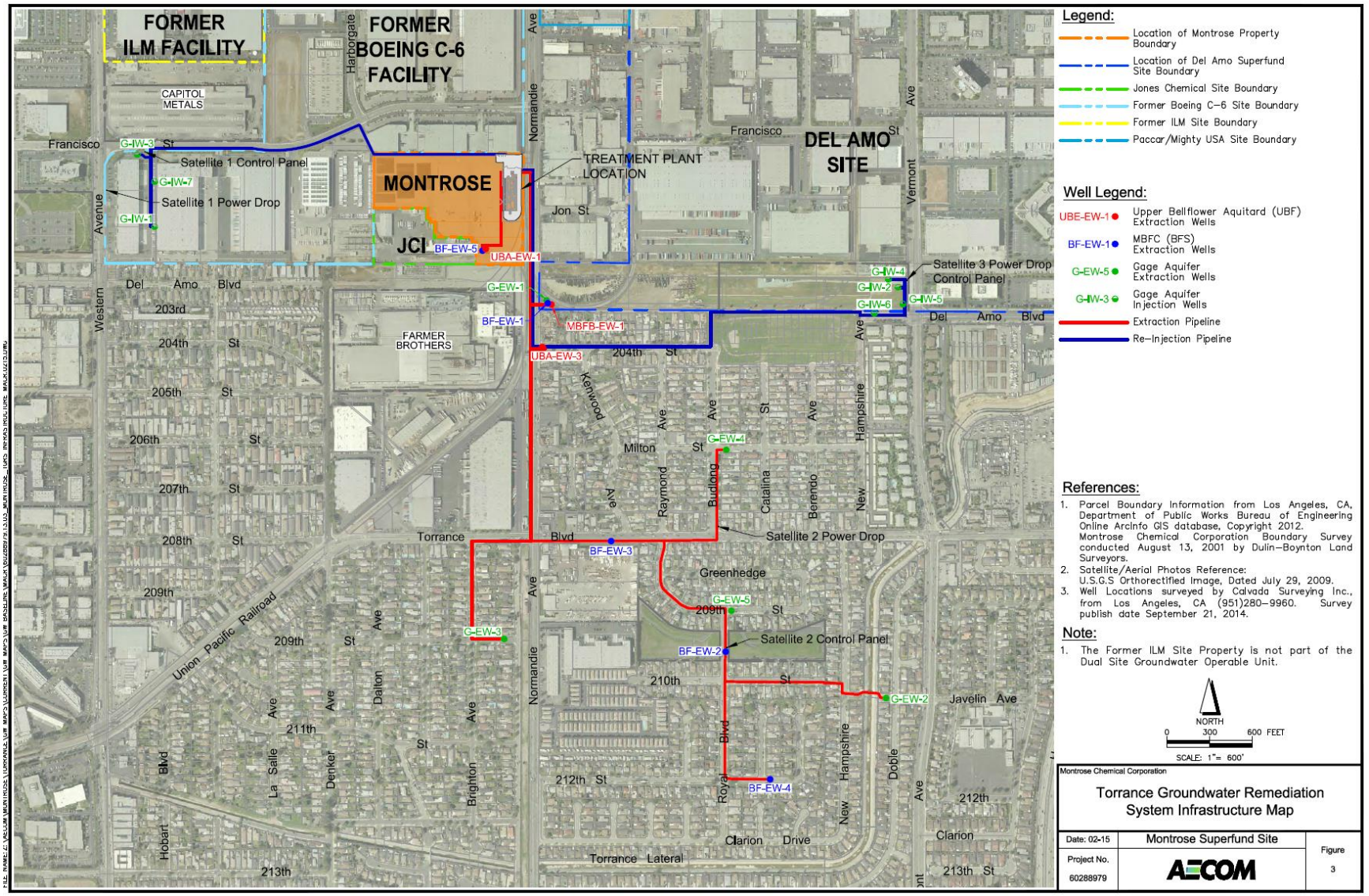

Figure 4-3. Groundwater Treatment System Layout

4.3. Operation and Maintenance (O&M)

Operation of the groundwater treatment system has not yet begun.

Montrose submitted a Monitoring and Compliance Plan (MACP) in July 2014 for the Montrose Chemical Superfund Site. The Montrose MACP describes monitoring requirements based on ROD objectives for remedy performance, including groundwater treatment and plume reduction. In addition, production well surveys are included in the MACP with sampling of drinking water production wells identified within the chlorobenzene and pCBSA plumes or within a quarter-mile of those two plumes. Monitoring and aquifer compliance reports (MACRs) will document groundwater monitoring, gauging, sampling, and analytical results to assess remedy performance and demonstrate compliance with ROD requirements. Only chlorobenzene and pCBSA isoconcentration contour maps are included in the MACRs for Montrose.

In September 2014, Shell Oil Company submitted an MACP for the Del Amo Superfund Site. The MACP describes monitoring requirements for Del Amo and a schedule for groundwater monitoring events. The Del Amo MACP focuses on the benzene plumes and the monitoring wells within the Del Amo Superfund Site boundaries. There is no consistent reporting of factors to evaluate fully of benzene biodegradation.

TCE is included as a COC in both of these MACPs, but the TCE plumes are not a focus of either plan. In order to determine reduction of all plumes (chlorobenzene, benzene, and TCE) and ensure that the containment zone is intact, a comprehensive sampling plan needs to be produced and an integrated report should be prepared.

5. Progress Since the Last Five-Year Review

5.1. Previous Five-Year Review Protectiveness Statement and Issues

This is the first FYR for Dual Site Groundwater OU.

6. Five-Year Review Process

6.1. Administrative Components

EPA Region 9 initiated the FYR in November 2014 and scheduled its completion for September 2015. The Five-Year Review team was comprised of the Five-Year Review coordinator and the Dual Site Remedial Project Manager, as well as the USACE team: Rick Garrison, geologist, Marlowe Laubach, chemical engineer, Kayla Patten, environmental engineer, and Aaron King, environmental engineer.

6.2. Community Involvement

EPA hosted community outreach events on May 4, and on June 19 and 20, 2015, to provide the community an opportunity to provide their comments, views, and concerns about the site. Comments and

interviews conducted during this outreach event are presented in Appendix C. The information provided by EPA is included in Appendix E.

The Five-Year Review report will be made available to the public once it has been finalized. Copies of this document will be placed in the following designated information repositories and on the Del Amo Superfund Site and the Montrose Chemical Superfund Site websites (http://yosemite.epa.gov/r9/sfund/r9sfdocw.nsf/vwsoalphabetic?openview).

Carson Public Library
151 East Carson Street
Carson, CA 90745
(310) 830-0901

Torrance Civic Center Library
3301 Torrance Boulevard
Torrance, CA 90503
(310) 618-5959

Superfund Records Center
Mail Stop SFD-7C
95 Hawthorne St., Room 403
San Francisco, CA 94105
(415) 536-2000

6.3. Document Review

This FYR included a review of relevant, site-related documents including the ROD, remedial action reports, and available groundwater monitoring reports. A complete list of the documents reviewed can be found in Appendix A.

6.3.1. ARARs Review

Section 121(d)(2)(A) of CERCLA specifies that Superfund remedial actions must meet any federal standards, requirements, criteria, or limitations that are determined to be applicable or relevant and appropriate requirements (ARARs). Applicable requirements are those standards, criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site. Relevant and appropriate requirements are those cleanup standards and other substantive environmental protection requirements promulgated under federal or state law that, while not directly "applicable" to a CERCLA site, address problems or situations sufficiently similar to those found at a site that their use is well suited to the particular cleanup.

The 1999 ROD identified a range of ARARs. The chemical-specific ARARs that were identified in the ROD were based on either state or federal maximum contaminant levels (MCLs) and adopted as in-situ groundwater standards (ISGS). Those that are still relevant to groundwater treatment and monitoring are listed in Table 6-1. For compounds where both a federal and California MCL existed, EPA selected as the ISGS the more stringent of the two. For compounds where neither a federal nor California MCL existed – that is, where there is no ARAR – EPA selected an alternative remedial action standard specific to this remedy: 1998 Region 9's tap water Preliminary Risk Goal (PRG). The PRG changes are discussed in the following section.

Table 6-1. Status of MCLs Identified as Cleanup Standards (ISGS) in the ROD

Compound	1999 ROD ISGS (µg/L)	Current Federal MCL (µg/L)	Current State MCL (µg/L)	Did Standards Change?
Benzene	1	5	1	No
Bromoform	**100**	**80***	**80***	**Yes – more stringent**
Carbon Tetrachloride	0.5	5	0.5	No
Chlorobenzene	70	100	70	No
Chloroform	**100**	**80***	**80***	**Yes – more stringent**
1,2-Dichlorobenzene	600	600	600	No
1,4-Dicholorobenzene	5	75	5	No
Dichlorobromomethane	**100**	**80***	**80***	**Yes – more stringent**
1,1-Dichloroethane	5	--	5	No
1,2-Dichloroethane	0.5	5	0.5	No
1,1-Dichloroethene	6	7	6	No
cis-1,2-Dichloroethene	6	70	6	No
trans-1,2-Dichloroethene	10	100	10	No
1,2-Dichloropropane	5	5	5	No
Endrin	2	2	2	No
Ethylbenzene	**700**	**700**	**300**	**Yes – more stringent**
Freon 11	150	--	150	No
Gamma-BHC	0.2	0.2	0.2	No
Heptachlor	0.01	0.4	0.01	No
Heptachlor epoxide	0.01	0.2	0.01	No
Methylene Chloride	5	--	5	No
Pentachlorophenol	1	1	1	No
Styrene	100	100	100	No
1,1,2,2-Tetrachloroethane	1	1	1	No
Tetrachloroethene	5	5	5	No
Toluene	150	1000	150	No
1,2,4-Trichlorobenzene	**70**	**70**	**5**	**Yes – more stringent**
1,1,1-Trichloroethane	200	200	200	No
1,1,2-Trichloroethane	5	5	5	No
Trichloroethene	5	5	5	No
Vinyl Chloride	0.5	2	0.5	No
Xylenes (total)	1,750	10,000	1,750	No

Bold indicates ROD ISGS greater than MCL.

* The individual federal and state MCLs for bromoform, chloroform, and dichlorobromomethane have been combined and are now regulated as "total trihalomethanes." These values reflect the new MCLs for total trihalomethanes.

Three standards changed because the federal and state MCLs for the individual compounds were eliminated in favor of a combined MCL. Specifically, the federal and state MCLs for bromoform, chloroform, and dichlorobromomethane were removed and are now regulated as "total trihalomethanes"

(THM). The state MCL for THM is 80 µg/L. Two standards changed because the state MCLs were lowered: California MCLs for ethylbenzene and 1,2,4-trichlorobenzene were updated to a lower value effective June 12, 2003. For all of these contaminants, protectiveness may be affected.

There have been a few changes to the location-specific and action-specific ARARs identified in the ROD. Those changes, none of which affect the protectiveness of the remedy, are described in Appendix B.

The ROD identifies California's Anti-Degradation Policy as an applicable requirement for the selected remedy "with respect to the reinjection of groundwater that has been extracted from the Joint Site as the result of remedial actions required by this ROD." ROD at A-9; State Water Resources Control Board Resolution 68-16, "Statement of Policy with Respect to Maintaining High Quality Waters in California." However, the reinjection of pCBSA at the selected level of 25,000 µg/L will entail some degradation of the receiving aquifer, which currently has very low to non-detect levels of pCBSA in the vicinity of the reinjection wells. Having selected the Anti-Degradation Policy as an ARAR, the ROD did not explicitly include the analysis that the policy requires. An Anti-Degradation Policy analysis should therefore be conducted before the groundwater treatment system start full operation.

6.3.2. Human Health Risk Assessment Review

In 1998, EPA produced a report evaluating the potential human health risk of exposure to Dual Site OU groundwater: the Joint Groundwater Risk Assessment (JGWRA). EPA subsequently expanded that assessment and issued a supplement to the JGWRA. A summary of these reports was presented in the ROD. As part of this FYR, the risks summarized in the ROD were reviewed to identify any changes in exposure or toxicity that could impact protectiveness.

In the absence of any known exposure pathways, the JGWRA and its supplement considered three hypothetical exposure pathways: ingestion, inhalation, and dermal contact. The inhalation pathway includes activities such as showering, toilet flushing, clothes washing, etc. Both risk assessments calculate the hypothetical risk to a person who uses the groundwater from a given hydrostratigraphic unit, with respect to all contaminants present. The two assessments, however, relied on two different methods to calculate risk: the JGWRA employed a plume averaging approach, and the supplement used the generation of risk contours. The plume averaging approach assumed that the receptor was directly exposed to the average of concentrations measured in monitoring wells in a given hydrostratigraphic unit.

The assessments concluded that risks from the groundwater – should anyone use it – are extremely high. Risk calculated by the plume-averaging method are as much as 12,000 times what EPA would consider a safe concentration for potable use and are above acceptable levels in all the affected hydrostrategraphic units.

Vapor Intrusion: EPA's understanding of contaminant migration from subsurface soil gas and/or groundwater into overlying buildings has evolved over the past several years, leading to the conclusion that vapor intrusion may pose a greater potential risk to human health then was understood when the ROD was issued. EPA evaluates the potential risk for vapor intrusion using a "multiple lines of evidence" approach consistent with its 2015 vapor intrusion guidance , "OSWER Technical Guide for Assessing and

Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air," OSWER Publication 9200.2-154.

Since issuance of the ROD, several vapor intrusion (VI) assessments have been performed at the Montrose Chemical and Del Amo Superfund Sites, including one specific to the Dual Site Groundwater OU. A summary of these assessments and data from the indoor air sampling is presented in Section 6.4 below.

Toxicity values: EPA's Integrated Risk Information System (IRIS) has a program to update toxicity values used by the Agency in risk assessment when newer scientific information becomes available. In the past five years, there have been a number of changes to the toxicity values for many COCs at the Site.

As noted above, the ISGS adopted in the ROD were based on ARARs, but only for those contaminants that had state or federal MCLs. For other contaminants, EPA selected in-situ groundwater standards that were based on its 1998 tap water PRGs, which represented an exposure risk at or below $1x10^{-6}$, as calculated at the time. For example, acetone is a contaminant of concern at the site, but neither EPA nor the State of California has yet issued an MCL for acetone, so the ISGS was based on EPA's 1998 tap water PRG instead, which was 610 µg/L. *See* Table 6-2, below.

To evaluate the protectiveness of the ISGS for this FYR, those standards were compared to EPA's current Regional Screening Levels (RSLs). The RSLs are chemical-specific concentrations for individual contaminants that correspond to an excess cancer risk level of $1x10^{-6}$ (or a Hazard Quotient (HQ) of 1 for non-carcinogens), and they have been developed for a variety of exposure scenarios (e.g., residential, commercial/industrial). RSLs are not de facto cleanup standards for a Superfund site, but they do provide a good indication of whether actions may be needed to address potential human health exposures. The EPA acceptable risk range is between $1x10^{-6}$ and $1x10^{-4}$. RSL values that fall within this range were determined to be acceptable from a risk stand point. Table 6-2 below presents this comparison.

Table 6-2. Comparison of ROD Groundwater Cleanup Standards (ISGS) to Current Toxicity Information

Contaminant of Concern	Tap Water RSL for cancer risk (µg/L)	Protective Cancer Risk Range (µg/L)	Tap Water RSL for non-cancer hazard (µg/L)	1999 ROD ISGS (µg/L)
Acetone	--	--	14,000	610
Acrolein	--	--	0.042	0.042
Acrylonitrile	0.052	0.052 – 5.2	4.1	3.7
Aldrin	0.0092	0.0092-0.92	0.6	0.004
Alpha-BHC	0.0071	0.0071 – 0.71	97	0.011
Benzene	0.45	0.45 - 45	5.7†	1
Beta-BHC	0.025	0.025 – 2.5	--	0.037
Beta-Endosulfan	**--**	**--**	**100**	**220**

Contaminant of Concern	Tap Water RSL for cancer risk (µg/L)	Protective Cancer Risk Range (µg/L)	Tap Water RSL for non-cancer hazard (µg/L)	1999 ROD ISGS (µg/L)
Bromoform	3.3	3.3-330	380	100
Bromomethane	**--**	**--**	**7.5**	**8.7**
Di-n-Butyl phthalate	**--**	**--**	**900**	**3,700**
sec-Butylbenzene	--	--	2,000	61
Carbon Disulfide	**--**	**--**	**810**	**1,000**
Carbon Tetrachloride	0.11†	0.11-11†	49	0.5
Chlorobenzene	--	--	78	70
Chloroethane	--	--	21,000	8,600
Chloroform	**0.22**	**0.22 - 22**	**97**	**100**
Chloromethane	--	--	190	1.5
2 Chlorophenol	--	--	91	38
Cyclohexane	--	--	13,000	350
DDD (total)	0.031	0.031 – 3.1	--	0.28
DDE (total)	0.46	0.46-46	--	0.20
DDT (total)	0.23	0.23 – 23	10	0.20
1,2-Dichlorobenzene	**--**	**--**	**300**	**600**
1,3-Dichlorobenzene	--	--	--	17
1,4 Dicholorobenzene	0.48	0.48 – 48	570	5
Dichlorobromomethane	**0.13**	**0.13 – 13**	**380**	**100**
1,1-Dichloroethane	2.7	2.7 – 270	3,800	5
1,2-Dichloroethane	0.17	0.17 – 17	13	0.5
1,1-Dichloroethene	--	--	280	6
cis-1,2-Dichloroethene	--	--	36	6
trans-1,2-Dichloroethene	--	--	360	10
1,2 Dichloropropane	0.44	0.44 – 44	8.3	5
Diethylphthalate			**15,000**	**29,000**
Endrin	--	--	2.3	2
Ethylbenzene	**1.5**	**1.5 – 150**	**810**	**700**
Freon 11	--	--	1,100	150
Freon 12	**--**	**--**	**200**	**390**

Contaminant of Concern	Tap Water RSL for cancer risk (µg/L)	Protective Cancer Risk Range (µg/L)	Tap Water RSL for non-cancer hazard (µg/L)	1999 ROD ISGS (µg/L)
Gamma-BHC	0.041	0.041 – 4.1	3.6	0.2
Heptachlor	0.0014	0.0014-0.14	1.3	0.01
Heptachlor epoxide	0.0014	0.0014-0.14	0.12	0.01
2-Hexanone	**--**	**--**	**38**	**160**
Isopropylbenzene	--	--	450	61
Methyl Ethyl Ketone	--	--	5,600	1900
4-Methyl-2-Pentanone	--	--	1,200	160
Methylene Chloride	11	11 – 1,100	110	5
2-Methylnaphthalene	--	--	36	6.2
Naphthalene	0.17	0.17 – 17	6.1	6.2
Pentachlorophenol	0.04	0.04 – 4	23	1
Phenol	**--**	**--**	**5,800**	**22,000**
n-Propylbenzene	--	--	660	61
Styrene	--	--	1,200	100
1,1,2,2-Tetrachloroethane	0.076	0.076 – 7.6	360	1
Tetrachloroethene	0.19†	0.19-19†	41	5
Toluene	--	--	1,100	150
1,2,4-Trichlorobenzene	**1.1**	**1.1 – 110**	**4.0**	**70**
1,1,1-Trichloroethane	--	--	8,000	200
1,1,2-Trichloroethane	**0.28**	**0.28 – 28**	**0.41**	**5**
Trichloroethene	**0.49**	**0.49 – 49**	**2.8**	**5**
1,2,4-Trimethylbenzene	--	--	15	12
Vinyl Acetate	--	--	410	410
Vinyl Chloride	0.019	0.019 -1.9	44	0.5
Xylenes (total)	**--**	**--**	**190**	**1,750**

ROD: Record of Decision; ISGS: In-situ groundwater standard; RSL: regional screening level.

Bold indicate ROD ISGS greater than RSL.

† California Modified screening levels (DTSC-SLs) Table 2, DTSC HERO note number 3, May, 2015.

Any concentration below the cancer RSL indicates that cancer risk is low, while concentrations significantly above the cancer RSL may indicate an increase in cancer risk. For several COCs, the tap water RSLs for cancer risk are less than the ISGS values as noted above. Of these COCs, the ISGS values

are within the acceptable cancer risk range of $1x10^{-6}$ to $1x10^{-4}$ – with the exception of chloroform, dichlorobromomethane, and ethylbenzene – and are therefore considered protective with respect to cancer risks.

- For chloroform, the cancer and non-cancer RSLs (0.22 μg/L and 97 μg/L, respectively) are less than the ISGS value (100 μg/L), which was the MCL at the time of the ROD. Recent groundwater sampling performed in 2014 detected concentrations of chloroform ranging from non-detect to 31,000 μg/L. Therefore, the ISGS value for chloroform may not be protective with respect to cancer or non-cancer risks.

- For dichlorobromomethane, the cancer RSL (0.13 μg/L) is less than the ISGS value (100 μg/L), which was the MCL at the time of the ROD. As stated earlier, chloroform and dichlorobromomethane no longer have their own MCL but are now regulated as total trihalomethanes or THM. The State MCL for total trihalomethanes is 80 μg/L. Dichlorobromomethane was not detected in wells that were sampled in the recent groundwater sampling performed in 2014. Therefore, changes in toxicity do not affect the protectiveness of the ISGS value for dichlorobromomethane.

- For ethylbenzene, the cancer RSL (1.5 μg/L) is less than the ISGS value (700 μg/L), which was the MCL at the time of the ROD. Ethylbenzene concentrations from recent groundwater sampling performed in 2014 ranged from non-detect to 24,000 μg/L. Therefore, the ISGS value for ethylbenzene may not be protective of cancer risks.

For non-cancer risk, fourteen COCs (beta-endosulfan, bromomethane, di-n-butyl phalate, carbon disulfide, 1,2-dichlorobenzene, naphthalene, diethylphthalate, Freon 12, 2-hexanone, phenol, 1,2,4-triclorobenzene, 1,1,2-trichloroethane, TCE, and xylenes) have ISGS values greater than the non-cancer RSL. Any concentration below the non-cancer RSL indicates that no adverse health effect from exposure is expected, while concentrations significantly above the non-cancer RSL may indicate an increased potential for non-cancer effects.

Recent groundwater sampling performed in 2014 did not detect bromomethane, di-n-butyl phthalate, diethylphthalate, or phenol in any of the wells sampled. Naphthalene was also not detected in any of the wells sampled; however, many of the laboratory reporting limits were greater than the ISGS value. Carbon disulfide was detected in one well, SWL0061, at a concentration of 0.39 μg/L, well below the current non-cancer RSL and below the state notification level of 160 μg/L. Freon 12 was detected in several wells with concentrations ranging from non-detect to 3.5 μg/L, also well below the non-cancer RSL and ISGS value. 2-hexanone was detected in several wells with concentrations ranging from non-detect to 11 μg/L, also below the non-cancer RSL and ISGS value. Therefore, the change in the non-cancer risk screening level does not affect the protectiveness for these COCs.

Several other COCs (1,2-dichlorobenzene, 1,2,4-trichlorobenzene, 1,1,2-trichloroethane, TCE, and xylenes) were detected in the most recent groundwater sampling event above their respective non-cancer RSLs. For these COCs, however, the ISGS were based on either state or federal MCLs, and the detected

concentrations are all below the MCLs. MCLs are set at levels that EPA deems protective of human health. The ISGS values for these compounds are therefore considered protective for cancer and non-cancer risks.

Although the remedy did not consider vapor intrusion, there have been recent significant changes to indoor air concentration toxicity values for TCE. In 2011, EPA conducted an updated assessment for TCE which included a risk of fetal cardiac malformations due to short-term in utero exposures to TCE as a result of inhalation. This IRIS assessment set a reference concentration (RfC) of 2 $\mu g/m^3$. In 2014 EPA Region 9 issued a memorandum regarding *EPA Region 9 Interim Action Levels and Response Recommendations to Address Potential Developmental Hazards Arising from Inhalation Exposures to TCE in Indoor Air from Subsurface Vapor Intrusion* and EPA's Office Of Superfund Remediation and Technology Innovation issued a memorandum to the EPA Regional Superfund offices on *Compilation of Information Relating to Early/Interim Actions at Superfund Sites and the TCE IRIS Assessment.* These changes indicate that the risk from indoor air TCE is greater than previously determined.

The 1999 ROD also selected a reinjection standard for para-chlorobenzene sulfonic acid, pCBSA, a by-product of DDT synthesis. There is limited toxicity information on pCBSA. Consistent with established Superfund practice for chemicals with no toxicity values, EPA Region 9 requested that EPA's Superfund Technical Support Center (STSC) conduct an evaluation of pCBSA in 1999. Based on the available studies (all of which were conducted in the 1980s) and pCBSA's physical and chemical properties, STSC determined that pCBSA is not likely to be a carcinogenic hazard and that it presents a low risk of non-cancer effects. EPA concluded that there was insufficient data to derive a screening level value. To date, there has been no new toxicity data developed for pCBSA.

In 1994, California DTSC evaluated the same limited toxicity information available to EPA, and concluded that a pCBSA concentration between 25,000 to 35,000 µg/L would be protective for a reinjection standard at the Dual Site. A reinjection standard of 25,000 µg/L was selected in the 1999 ROD based on the request of California.

In 2015, California re-evaluated its earlier toxicity assessment for pCBSA. California's Office of Environmental Health Hazard Assessment (OEHHA) used the same toxicity studies that California and EPA had previously reviewed, but applied the 2015 default California exposure assumptions, which have changed from the 1990s-era assumptions with respect to childhood exposure. OEHHA arrived at a recommendation for a public health protective concentration of 3,000 µg/L. Similar to a public health goal, a public health protective concentration is based on a risk assessment using the most current principles, practices and methods; however, it differs from a public health goal in that it does not undergo formal public review and comment, or an external scientific peer review.

EPA's Superfund Technical Support Center reviewed OEHHA's reassessment and, in April 2015, concluded that OEHHA's reassessment was "not reliable." STSC acknowledged in its review that OEHHA's methodologies may differ from EPA's, and that the methodologies had changed since the original assessment. In August 2015, STSC determined that there is still insufficient information to determine a screening provisional reference value for pCBSA. The STSC final review is included in Appendix F.

Currently, there is no use of the shallow groundwater. The nearest production wells are screened primarily in the Silverado aquifer, which occurs at a depth of approximately 450 ft. bgs, which is significantly deeper than the zone of reinjection in the Gage Aquifer (140 to 200 feet bgs). The Silverado aquifer is also separated from the Gage and Lynwood aquifers by the Lynwood-Silverado aquitard with a thickness of over 200 feet. In addition, the nearest production wells that might be impacted are located over a mile from the injection sites. EPA's preliminary modeling of the impact of reinjecting pCBSA at 25,000 µg/L shows that drinking water production wells will not be impacted by pCBSA in the next 50 years, which is the maximum timeframe allowed calculated by the model.

6.3.3. Ecological Review

The JGWRA and its supplement focused on human receptors and their potential exposure to contaminated groundwater. Because the contamination is primarily in groundwater, terrestrial or avian receptors, if present, would not be exposed to site contamination.

6.4. Data Review

6.4.1. Production Wells

In 2015, with the aid of the Water Replenishment District of Southern California (WRD) and the State Water Resources Control Board (SWRCB), EPA identified appropriate production wells near the Site for sampling. The WRD supplied information showing that within a radius of 4 miles of the Site, there are many production wells, monitoring wells and industrial water wells. Most production and industrial wells are screened in the Silverado aquifer. The nearest production supply well is about 1 mile downgradient of the Site and has been inactive since July 2006. It is screened between 510 and 680 feet bgs. The closest operating municipal wells are Well 279-01, located approximately 2 miles downgradient from the Site, and Madrona #2, located approximately 2 miles cross-gradient from the Site. EPA collected samples from these two wells on January 21, 2015, and analyzed for pCBSA. SWRCB followed up on January 28, 2015, and collected samples from seven production wells in the area and analyzed for pCBSA and VOCs. All samples tested non-detect for VOCs and pCBSA.

Table 6-3 Production Wells near the Dual Site

Well	Owner	Date of Sampling	Location	Screened Interval
Madrona Well #2	City of Torrance	1/21/2015 (EPA) 1/28/2015 (SWRCB)	Approximately 2 miles west of Site (cross gradient)	310 – 425 ft. bgs
Well 279-01	CWSC	1/21/2015 (EPA) 1/28/2015 (SWRCB)	Approximately 2 miles south of Site (downgradient)	480 – 652 ft. bgs
Well 275-01	CWSC	1/28/2015 (SWRCB)	Approximately 3 miles south of Site (downgradient)	Unavailable
Well 277-01	CWSC	1/28/2015 (SWRCB)	Approximately 3 miles southeast of Site (downgradient)	Unavailable
Well 215-01	CWSC	1/28/2015 (SWRCB)	Approximately 3-1/2 miles east-southeast of Site (downgradient)	Unavailable
Well 298-01	CWSC	1/28/2015 (SWRCB)	Approximately 3-1/2 miles east-southeast of Site (downgradient)	Unavailable

Well	Owner	Date of Sampling	Location	Screened Interval
Dalton #1	CWSC	1/28/2015 (SWRCB)	Approximately 1 mile north of the Site (upgradient)	544 – 734 ft. bgs

CWSC – California Water Service Company

6.4.2. Monitoring Well Network

Groundwater monitoring is necessary to confirm containment of the Dual Site contaminants of concern – in particular, benzene, chlorobenzene, and TCE – and to evaluate the performance of remedial action activities.

The groundwater monitoring well network consists of over 200 wells installed over a 30-year period by the potentially responsible parties (PRPs). The ROD requires sampling of monitoring wells to ensure that the objectives of the EPA-approved Monitoring Plans are achieved, and that data collected are sufficient to evaluate reliably compliance with the requirements, standards, and provisions set forth in the ROD. In the 2014 coordinated groundwater sampling effort, the PRPs sampled over 160 wells for water quality. An additional 100 wells were sampled by other parties at locations near the Dual Site.

As specified in the ROD, treated groundwater will be injected into the subsurface to provide hydraulic control and to ensure that the extraction of contaminated groundwater does not cause unreasonable NAPL mobilization into adjacent aquifer units. The ROD also requires the movement of pCBSA in groundwater be routinely monitored. One of the objectives of monitoring pCBSA movement is to evaluate the effect that aquifer injection may have on pCBSA distribution. Extracted groundwater will be treated before reinjection, but levels of pCBSA may be as high as 25,000 µg/L in the reinjected water. EPA's current evaluation indicates that the limited number of wells in the Gage and Lynwood are insufficient to monitor the movement of pCBSA. Lastly, as specified in the ROD, the full extent of detectable pCBSA contamination in the groundwater shall be determined. Therefore, additional wells are needed within the Gage and Lynwood aquifer units to adequately assess current and future pCBSA distribution.

The ROD also requires periodic (five year) well surveys of both private and public wells. The survey is intended to ensure that groundwater is not being used in a manner that would present an unacceptable health risk. In addition, well surveys shall identify any new wells which may lie within the pCBSA distribution. The last well survey was conducted in 2003.

Finally, the ROD requires collection of groundwater data sufficient to characterize the downgradient extent of the pCBSA plume and sufficient sampling of production wells. In 2006, the ROD-required "data acquisition" program was conducted to, among other goals, identify and characterize the sources of chlorinated solvents such as TCE and to define the distribution of TCE, benzene, and pCBSA. The data from this program did define the primary extent of pCBSA, but did not delineate the pCBSA plume completely. In addition, the existing well network may not be sufficient to evaluate the effects of pCBSA injection into the Gage Aquifer.

6.4.3. Groundwater

Data reviewed for groundwater monitoring included groundwater level data and contaminant sampling results taken between 2004 and 2014 at the Dual Site. The groundwater monitoring reports submitted to date have not been integrated into a single report for the Dual Site nor do they include consistent terminology, tabular formats and figures. This FYR also included a limited review of groundwater data from other facilities near the Dual Site. However, groundwater data from such sites was not evaluated in detail as part of this review; a more detailed review may be warranted for future reviews.

Groundwater monitoring is conducted at wells in the vicinity of the Joint Site by the responsible parties. Groundwater data were presented in reports by Hargis + Associates, Inc. (2007, 2009) and AECOM (2012, 2015) for Montrose Chemical, and by URS (2005, 2012, 2015) for Shell Oil. This five-year review also examined groundwater data that was generated from adjacent sites conducting investigations or remediation under State oversight: the Boeing C-6 facility and the former International Light Metals facility. Data from both sites are available at https://geotracker.waterboards.ca.gov. Both sites are located to the north and west of the Dual Site and considered upgradient with respect to groundwater flow. The available documents indicate that many of the Dual Site wells – i.e., those maintained and sampled by the responsible parties – have been sampled since 1999 (URS, 2015). Many of the monitoring wells have been sampled multiple times between 2004 and 2014 site wide and in 2006 and 2011 at the Waste Pits area of the Del Amo Site. With the development of Monitoring and Aquifer Compliance Plans as required by the ROD, the implementing parties are expected to conduct groundwater monitoring on a more consistent basis to generate a single comprehensive set of groundwater data to meet monitoring objectives for the Dual Site. Although a baseline sampling event was conducted in September 2014, the data generated were presented in two separate and inconsistent reports, did not meet reporting requirements as described in the MACPs, and did not include TCE contaminant distribution or plume maps. A second baseline event is currently underway, scheduled to be completed in October 2015.

A summary of the results for benzene, chlorobenzene, TCE, and pCBSA is presented below. The major focus of data review is to assess whether the contaminant distributions have changed and to determine to what extent intrinsic biodegradation is occurring in the UBF and MBFB sand units.

6.4.3.1 Water Table Unit - Upper Bellflower (UBF)/ Middle Bellflower B Sand (MBFB)

The stratigraphy is inclined underneath the Dual Site, resulting in the water table crossing from the UBF to the MBFB near the boundary between the two sites (Figure 3-2). This uppermost water-bearing zone occurs in the UBF underneath the Del Amo portion of the Dual Site, but occurs in the MBFB to the west and beneath the Montrose portion of the Dual Site. The following is a summary of the groundwater sampling results reported for the Dual Site in the 2014 Baseline Groundwater Monitoring Report (URS, 2015) and the 2014 Baseline Monitoring and Aquifer Compliance Report (AECOM, 2015), for the Del Amo and Montrose sites, respectively. These results include data collected within the UBF or MBFB depending upon at what depth the water table occurred at in that location. The MACR report submitted on behalf of Montrose defines water table results as wells screened in both the UBF and the MBFB.

- Groundwater levels in the UBF have remained relatively stable during the past few years. Although the groundwater surface elevation rose approximately 5.5 feet from 2001 to 2009, it has recently stabilized and fluctuated only about 0.5 feet between 2009 and 2014. Groundwater flow is generally toward the south southwest, but locally exhibits appreciable variability. Beneath the Del Amo site, the groundwater gradient is relatively flat at 0.0006 (URS, 2015). Beneath the Montrose site, the hydraulic gradient in the MBFB is also relatively flat at approximately 0.0002. Groundwater extraction at the Boeing facility north of Montrose has affected the water table, but the general groundwater flow direction remains toward the south beneath the Montrose site (AECOM, 2015).

- **TCE:** TCE above the ISGS of 5 µg/L is present in the water table unit primarily beneath and south of the Montrose site, along the western portion of the Del Amo site, and as isolated plumes along the southern portion of the Del Amo site. Substantial portions of the TCE plume west and southwest of the Dual Site are outside of the containment zone. The primary source(s) of TCE are located north and northwest of the Montrose/Del Amo site, where concentration up to 46,000 µg/L are reported in the UBF. Concentrations beneath and south of the Montrose site are typically less than 200 µg/L. Concentrations in the central and southern portions of the Del Amo site typically are less than 100 µg/L, but do range up to 810 µg/L in the southwestern corner of the site. Along the western border of the Del Amo site high TCE concentrations (up to 9,400 µg/L) are found downgradient of TCE source areas near Normandie Avenue. The extent of the TCE plume appears to be stable in the southeastern direction of the Montrose property as shown in Figure 6-1. However, to better characterize the entire TCE plume and its degradation products, data from upgradient sources should be fully integrated into the Dual Site data set.

- **Benzene:** Within the UBF, benzene above the ISGS (1 µg/L) is found associated with both the Del Amo and Montrose site. Within the Del Amo site elevated benzene concentrations in the UBF are found in association with confirmed or suspected NAPL areas. Along the west-central portion of the site, elevated dissolved benzene (46,000 µg/L) was detected in 2014 downgradient of the confirmed NAPL area near wells XMW-20 and SWL0001. In the southern and central potions of the former Butadiene Plancor site, located along the western property line at the Del Amo Site (see Figure 3-4), elevated dissolved benzene (330,000 µg/L and 150,000 µg/L, respectively) is present downgradient of identified NAPL areas. Elevated benzene concentrations (280,000 µg/L) were also observed in the vicinity of the Waste Pits, which is an area suspected of containing NAPL. The benzene plumes emanating from sources at the Del Amo site appear to be contained within the containment zone; however, further additional data are need to confirm the benzene plume is contained within the containment zone east of the central portion of the Butadiene Plancor (See Figure 3-4). The second plume south of the southeastern corner of the Del Amo is much smaller and contains low levels of benzene (<3 µg/L). This small plume is only delineated by two wells, one of which is outside of the containment zone.

  The benzene in the water table unit beneath the Montrose facility and in the very southeast portion of the TI Waiver Zone is commingled with chlorobenzene and considered part of the chlorobenzene plume as defined by the ROD.

The extent and magnitude of benzene in the water table unit has decreased when compared to historic levels. Comparing 2012 groundwater data to 2004 data indicates that the lateral extent of the plume along the west-central portion of the Del Amo site has decreased appreciably (Figure 6-2) and maximum observed levels have decreased from 610,000 µg/L in 2004 to 46,000 µg/L in 2014. The benzene concentration in the plume located in the central portion of the Butadiene Plancor has decreased from a maximum of 442,110 µg/L in 2004 to 150,000 µg/L observed in the 2014. Comparison of the 2004 data to the 2012 data shows that the plume in the southern portion of the Del Amo site has a decreased, but the maximum benzene concentrations have remained about the same. During this period of decreasing benzene concentrations, the water table has risen significantly, which may partially explain the decrease in concentration. In the vicinity of the waste pit area, 2012 benzene concentrations are significantly lower relative to that found in 2004, and the plume has contracted significantly. These reductions have likely resulted from the active soil vapor extraction system at the waste pit area that has been operating since 2006 in conjunction with natural attenuation.

Biodegradation indicator analyses of benzene were completed for the 2014 baseline report (URS, 2015) to include thirteen Water Table wells along four transects. There is an overall indication that both aerobic and anaerobic biodegradation processes are occurring with the oxygen-reduction potential, sulfate, and alkalinity data being the strongest indicators. Other indicators used were ferrous iron, methane, carbon dioxide, nitrate, and dissolved oxygen. The results from these indicators, combined with findings indicating that the extent of benzene plumes area stable, indicate that natural attenuation may be occurring. However, decreasing concentrations could also be the result of a rising water table. Therefore, additional lines of evidence are needed to definitively determine in natural attenuation is occurring.

Also of concern is the general downward vertical gradient from the UBF to the MBFB in the southeastern portion of the Del Amo site. A significant benzene plume is present in the UBF with suspected NAPL, yet there is limited information/data for the underlying MBFB. The possibility exists that appreciable benzene has migrated vertically to underlying water-bearing units in this area. Additional investigation to evaluate the vertical (and lateral) extent of benzene in the southeastern portion of the Del Amo site is warranted.

- **Chlorobenzene:** The current chlorobenzene plume in the water table unit is centered beneath the Montrose property and extends offsite to the southeast and east (Figure 6-3). Core plume concentrations are reported at up to 350,000 µg/L (AECOM, 2015), which is similar to the 380,000 µg/L reported in 2004 (Hargis & Associates, 2007). The plume above the ISGS (70 µg/L) extends about 800 feet downgradient to the southeast and is present beneath a residential area (Figure 6-3). The plume also extends eastward to the border of the Del Amo site. The plume emanating from the Montrose property has generally remained stable since at least 2004, except for a recent increase in the downgradient concentrations (the toe of the plume beneath the residential area). The two isolated chlorobenzene plumes southeast of the site and an isolated plume appreciable west of the site that were reported in 2007 (Hargis & Associates, 2007) have decreased in concentration to below ISGS.

Chlorobenzene concentration at SWL0049 located in the neighborhood southeast of the Montrose property ranged from 2,900 µg/L in February 2012 to 12,000 µg/L in January 2014. In response, Montrose Chemical installed an extraction well (UBA-EW-3) west of SWL0049 at the intersection of 204th Street and Normandie Avenue. Groundwater was extracted from well UBA-EW-3 and treated using a mobile treatment unit from May 2014 to October 2014. Updated chlorobenzene concentrations at SWL0049 were reported at a peak of 13,000 µg/L in June 2014 to 6,200 µg/L in October 2014.

The extent of elevated chlorobenzene is not fully evaluated beneath the residential area as the nearest downgradient well is located over 800 feet to the south/southeast of well SWL0049. The plume moves southeast beneath the downgradient residential area; although this is based primarily on well MW-14, a well that historically has shown possibly anomalously low levels. Additional data may be needed to evaluate the observed increase in concentration in the downgradient direction.

- **pCBSA:** The current distribution of pCBSA is similar to that of chlorobenzene (Figure 6-4). There is no cleanup standard (ISGS) for pCBSA and the relative extent of pCBSA is shown at the injection performance standard of 25,000 µg/L. The core of the plume is beneath the Montrose site and exhibits a concentration up to 520,000 µg/L (URS, 2015). The plume extends downgradient to the southeast and east similar to that of chlorobenzene. The concentrations of pCBSA have decreased in the core area of the plume as reflected by historic concentrations of up to 770,000 µg/L reported in well MW-01 (Hargis & Associates, 2004) which decreased to 500,000 µg/L in 2014 (AECOM, 2015). The pCBSA plume extending southeast of the site appears to be increasing in concentration as reflected in well UBA-EW-3. The concentration of pCBSA in this well is currently 37,000 µg/L, approximately twice the value observed in 2006. Historically, pCBSA was detected in isolated areas west and southeast of the site, and pCBSA, no recent sampling has been conducted in those areas. Additional data may be needed to evaluate the current concentration of pCBSA in the former isolated plumes west and southeast of the Montrose site and the apparent increasing concentration in the downgradient toe of the plume extending southeast of the Montrose site.

- **Other VOCs:** Other VOCs have been found at elevated concentrations in groundwater in the UBF HSU. Beneath and in the vicinity of the Montrose site, these VOCs include carbon tetrachloride, chloroform, 1,1-dichlorobenzene, TBA, and PCE, Beneath and in the vicinity of the Del Amo site, these VOCs include ethylbenzene, naphthalene, toluene, xylenes, TBA; and the TCE degradation products of 1,1-DCE. Cis-1,2-DCA. Some of these VOCs are present in the UBF beneath the residential area southeast of the Montrose site and south of the Del Amo site.

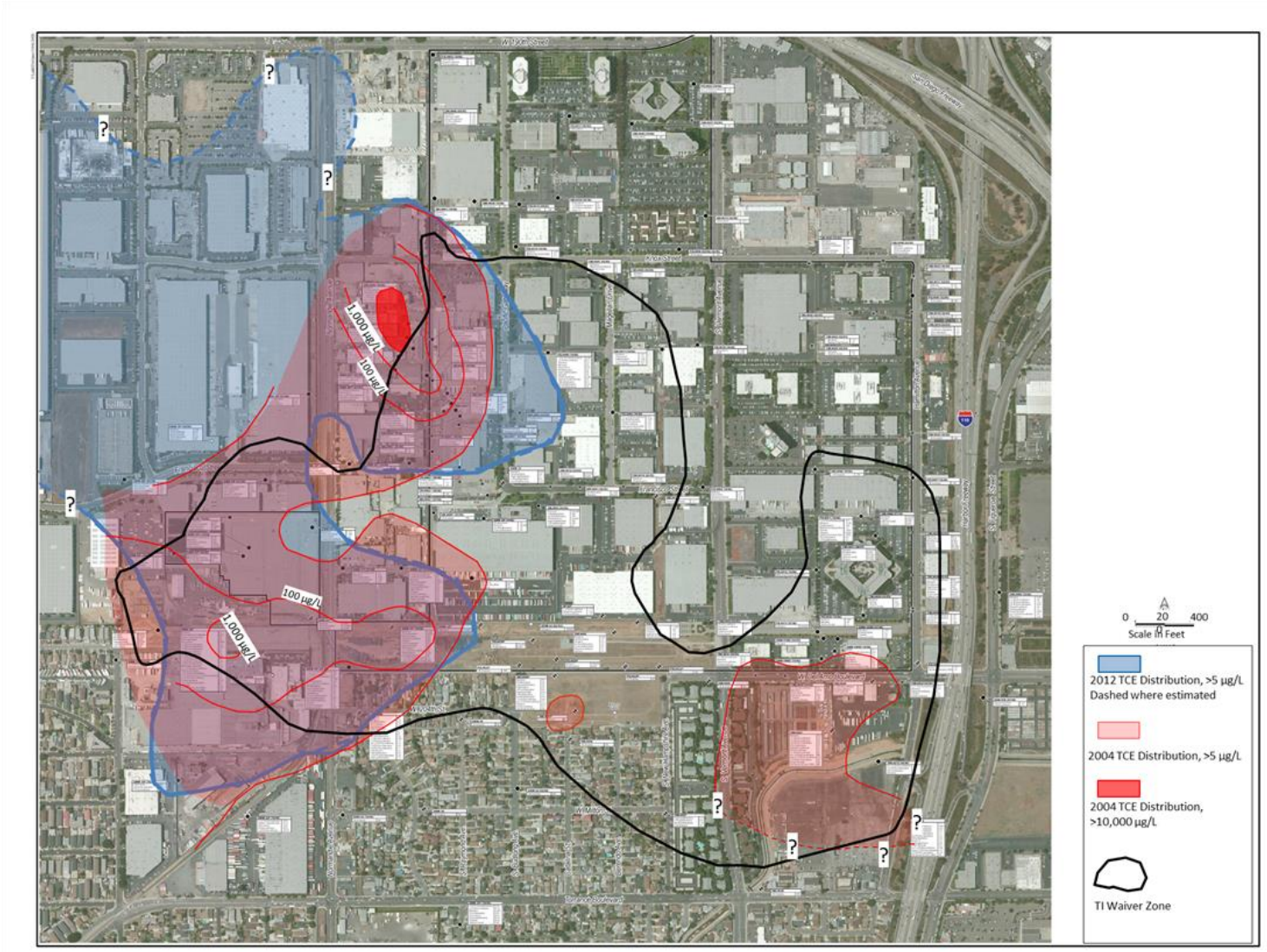

Figure 6-1. Comparison of 2004 with 2012 Dissolved TCE Distribution, Water Table Zone.
Source: URS, 2005 & 2012; AECOM, 2012

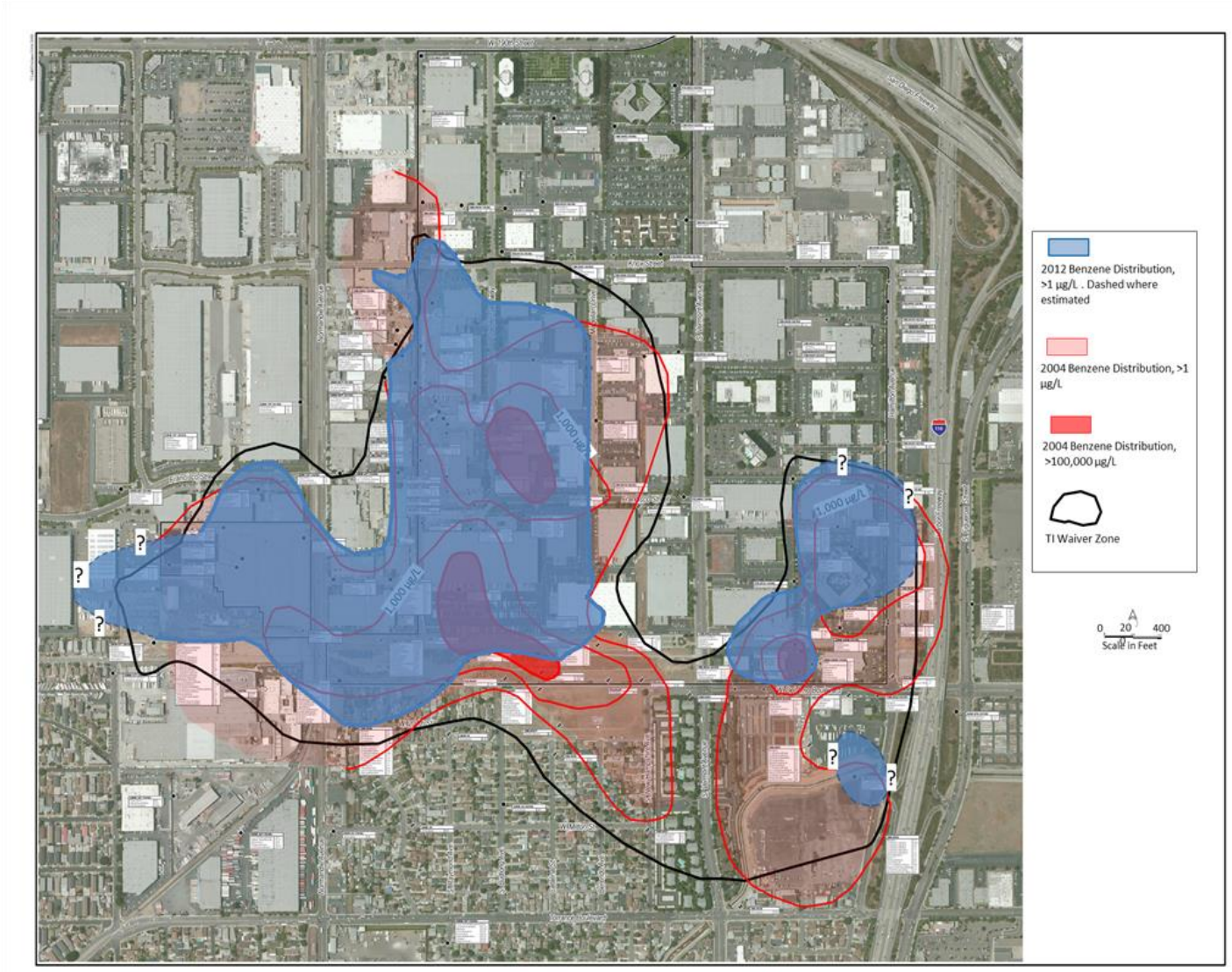

Figure 6-2. Comparison of 2004 with 2012 Dissolved Benzene Distribution, Water Table Zone.
Source: URS, 2005 & 2012; AECOM, 2012

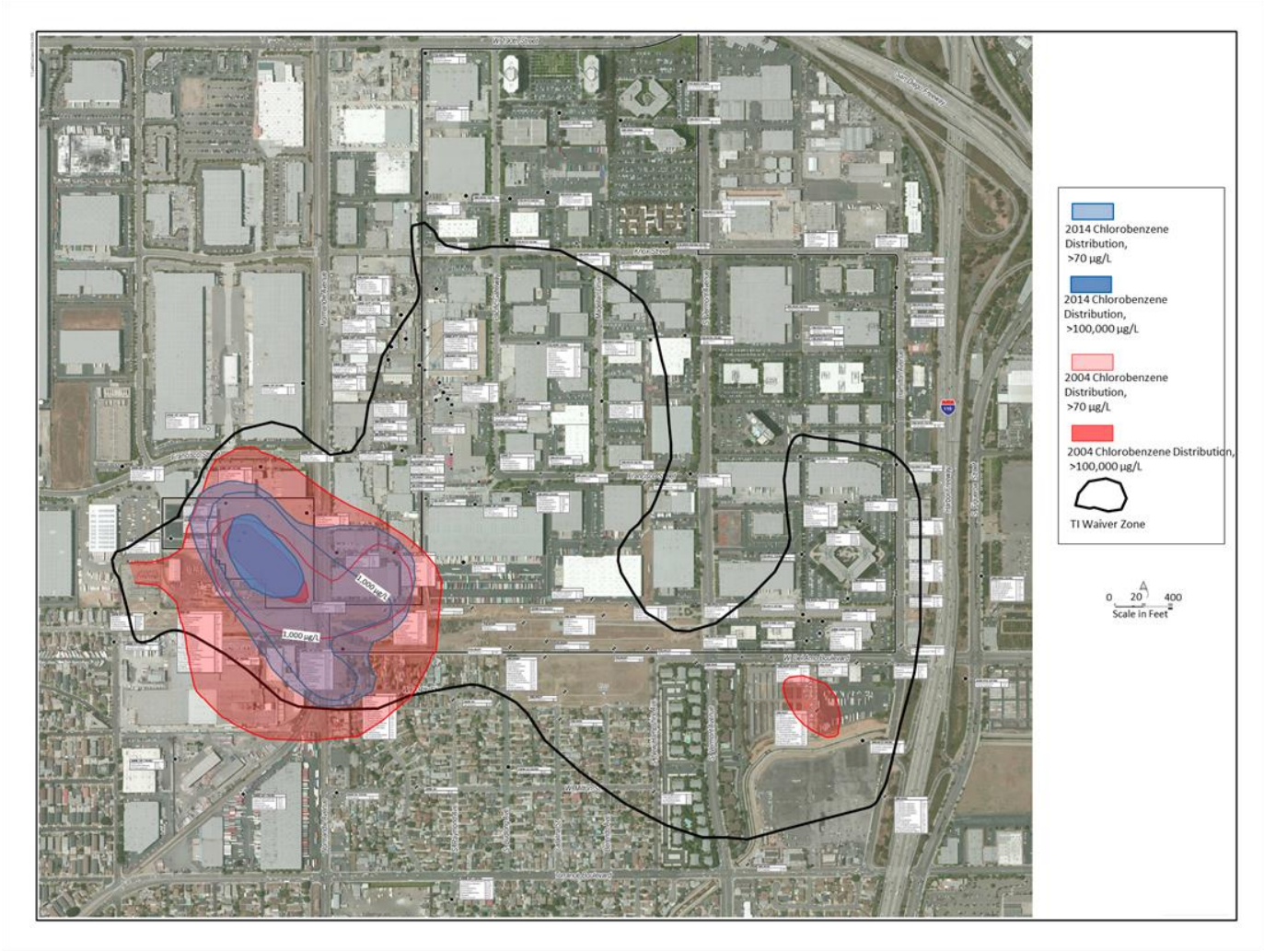

Figure 6-3. Comparison of 2004 with 2014 Dissolved Chlorobenzene Distribution, Water Table Zone.
Source: URS, 2005 & 2015; AECOM, 2015

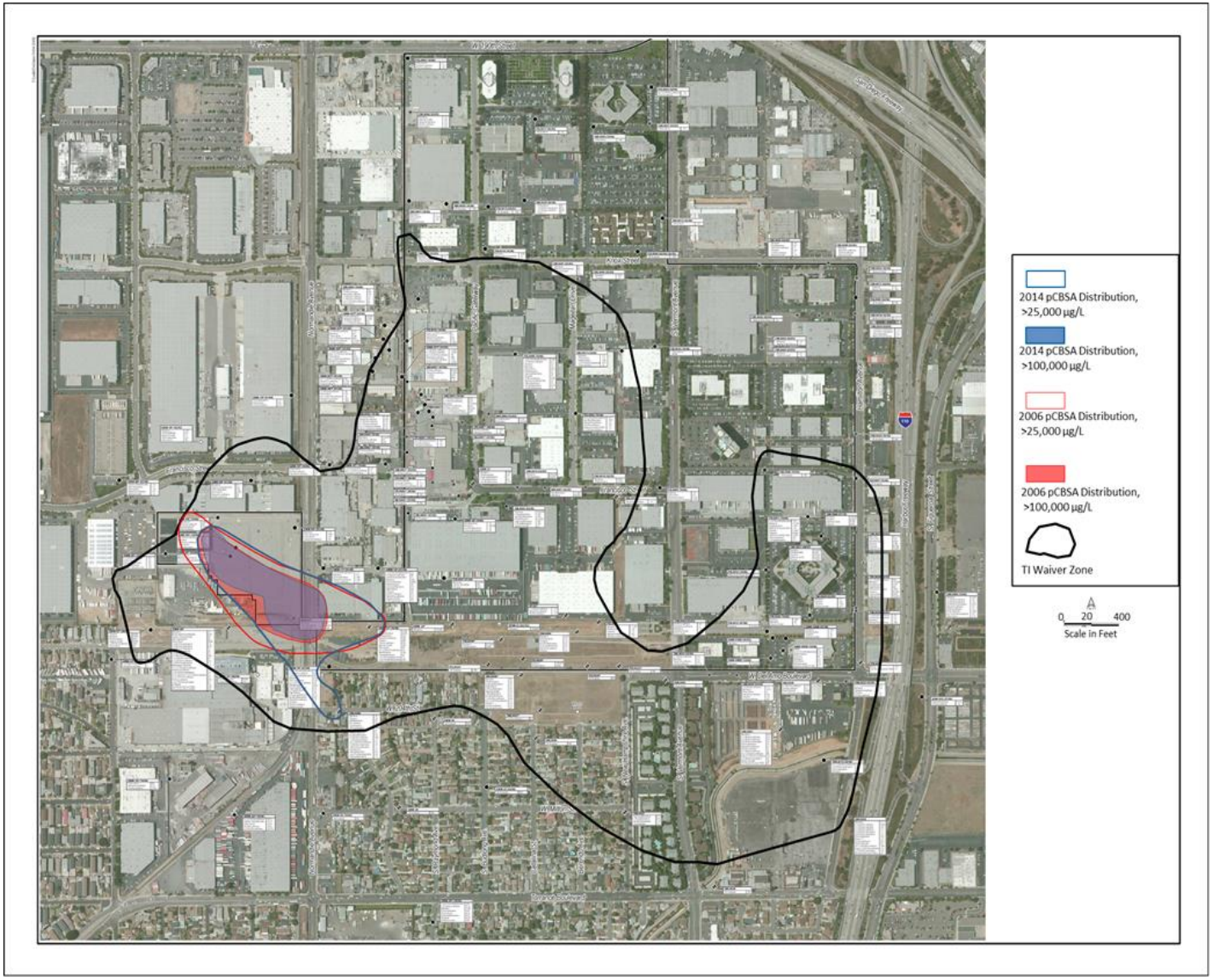

Figure 6-4 Comparison of 2006 with 2014 pCBSA Distribution, Water Table Zone.
Source: AECOM, 2015; Hargis + Assoc, 2007

6.4.3.2 Middle Bellflower B Sand (MBFB)

The MBFB Sand is the second water bearing unit at the Del Amo site. MBFB results beneath the Montrose site are captured as part of the water table unit summary in preceding section 6.4.2.1. Therefore, the following MBFB discussion is based on groundwater sampling and interpretation for the Del Amo site.

Based on the 2014 Del Amo Baseline Groundwater Monitoring report (URS, 2015), groundwater flow is generally from north to south/southeast beneath the Montrose and Del Amo sites. MBFB groundwater elevations in 2014 ranged from -6.41 ft. amsl at well MWB020 (located west/northwest of the Del Amo site), to -10.36 ft. amsl at well SWL0047 (located within the central portion of the Del Amo site) to -11.91 ft. amsl at well SWL0019 (located southeast of the Del Amo site). The resultant gradient was approximately 0.0005 ft/ft.

In 2004, the groundwater elevation at wells SWL0029 and XMW-28 equaled -13.85 ft. amsl and -14.89 ft. amsl, respectively. In 2014, groundwater elevations in these two wells were -8.91 ft. amsl and – 9.93 amsl, respectively. Therefore, groundwater elevations increased approximately 5 feet between years 2004 and 2014.

- **TCE:** The MBFB TCE distribution for years 2004 and 2012 is presented as Figure 6-5. At the time of the 2012 report only nine wells, located along the southern borders of the Montrose and Del Amo sites, were sampled for TCE. The remaining well results were from historic data and represent time periods between 1995 and 2006. Based on these data local TCE concentration maxima occur west and northwest of the Dual Site and do not vary greatly from values reported in 2004 Del Amo Baseline Groundwater Report (URS, 2004). TCE concentrations along the southern Montrose and Del Amo site boundaries range from 810 µ/L in the southwest corner of the Del Amo site well at XMW-13 to non-detect at multiple wells south and southeast of the Del Amo site. The maximum TCE concentration contoured in the 2012 Del Amo report was 18,000 µg/L at well IRZMW003A (a Boeing monitoring well) located over 600 feet north of the Montrose property.

  Multiple TCE source areas have been identified to the west and northwest of the Dual Site, and the groundwater contamination from these sources extends onto the Dual Site. As indicated on Figure 6-5, substantial portions of the total TCE distribution area exist outside of the containment zone. Revised evaluation of TCE distribution, including off-site sources, is needed for future assessment of TCE extent.

- **Benzene:** The MBFB benzene plume from is depicted in Figure 6-6. The portions of the benzene plume attributable to the Del Amo site sources remain within the containment zone and concentrations appear to have decreased since 2006 along the southern Del Amo site boundary. Notably, at locations within the southern portion of the Del Amo site and within the Waste Pits benzene detections decreased from 73,000 µg/L and 78,000 µg/L in 2012 to 36,000 µg/L and 2,700 µg/L in 2014, respectively. Decreased concentrations within the Waste Pits were likely the result of soil vapor extraction activities. Decreases at other locations within the Del Amo site may be

attributable to water level fluctuations and a rising water table since 2004.Within the MBFB, benzene continues to be the most commonly detected VOC.

NAPL has historically been observed in the northwestern portion of the Del Amo site at wells XMW-20, SWL0001 and SWL0032.

Biodegradation indicator analyses of benzene were completed for the baseline report (URS, 2015) to include six MBFB wells along one transect. There is a general indication that both aerobic and anaerobic biodegradation processes may be occurring with ORP, sulfate, and alkalinity data being the strongest indicators. However, as discussed earlier, additional lines of evidence are needed to definitively determine in natural attenuation is occurring.

- **Chlorobenzene:** The Distribution of chlorobenzene in the MBFB is discussed in Section 6.4.2.1 and presented on Figure 6-7.

- **pCBSA:** Similar to chlorobenzene the distribution of pCBSA in the MBFB is evaluated in Section 6.4.2.1 and presented in Figure 6-4.

- **Other VOCs:** As in the UBF, beneath and in the vicinity of the Del Amo site, these VOCs include ethylbenzene, naphthalene, toluene, xylenes, TBA; and the TCE degradation products of 1,1-DCE. Cis-1,2-DCA. The magnitude and extent of most of these other VOCS is fairly defined; however, TBA in the southeastern corner of the Del Amo site is poorly defined and is increasing in concentration. TBA is not defined by the ROD as a COC, however, recent detects warrant discussion. In 2012 well SWL0060 contained 13,000 µg/L TBA and concentrations increased to 160,000 µg/L in 2014. Additional data are needed to evaluate the extent of TBA in the MBFB.

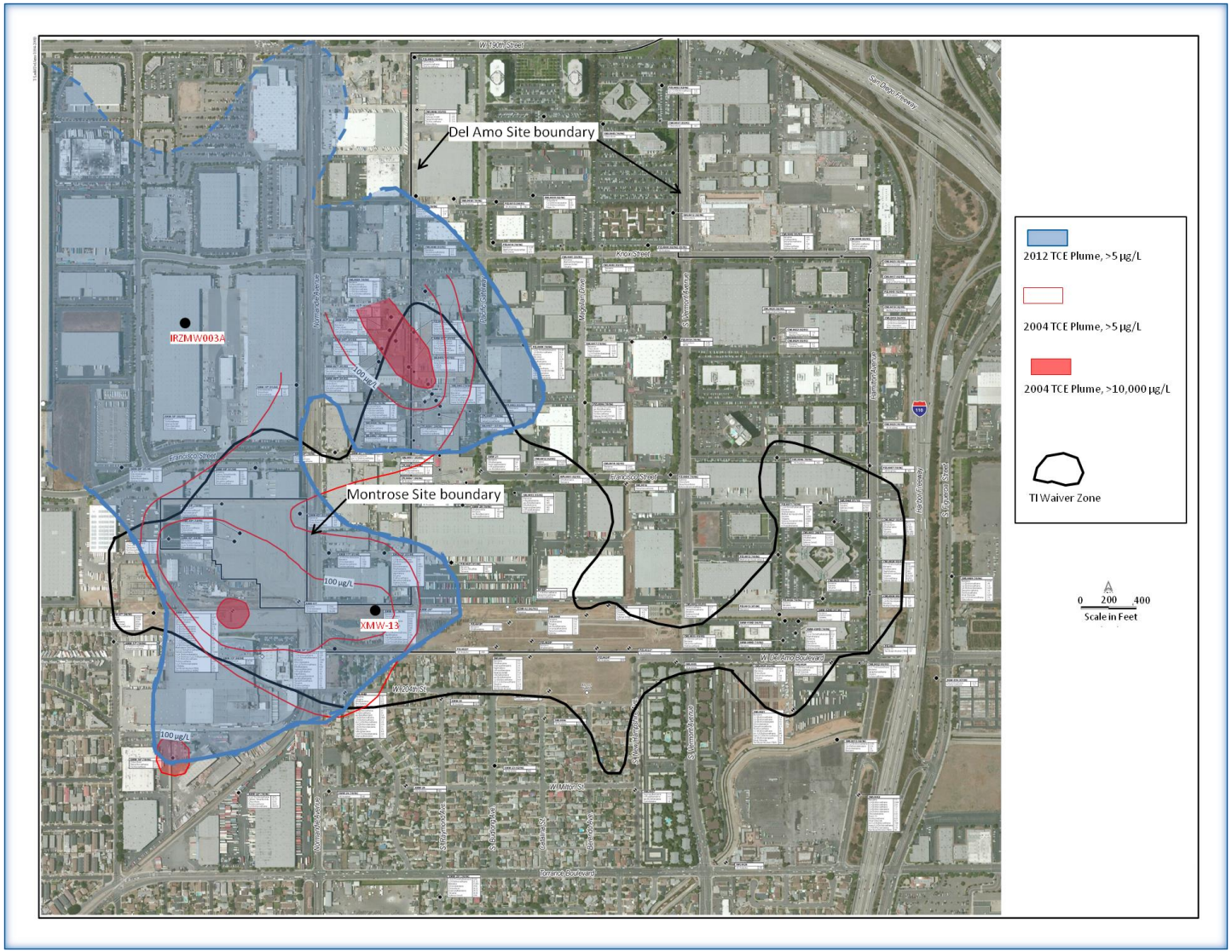

Figure 6-5. Comparison of 2004 with 2012 Dissolved TCE Distribution, Middle Bellflower B Sand (MBFB) Aquifer.
Source: URS, 2005; CH2MHill, 2012.

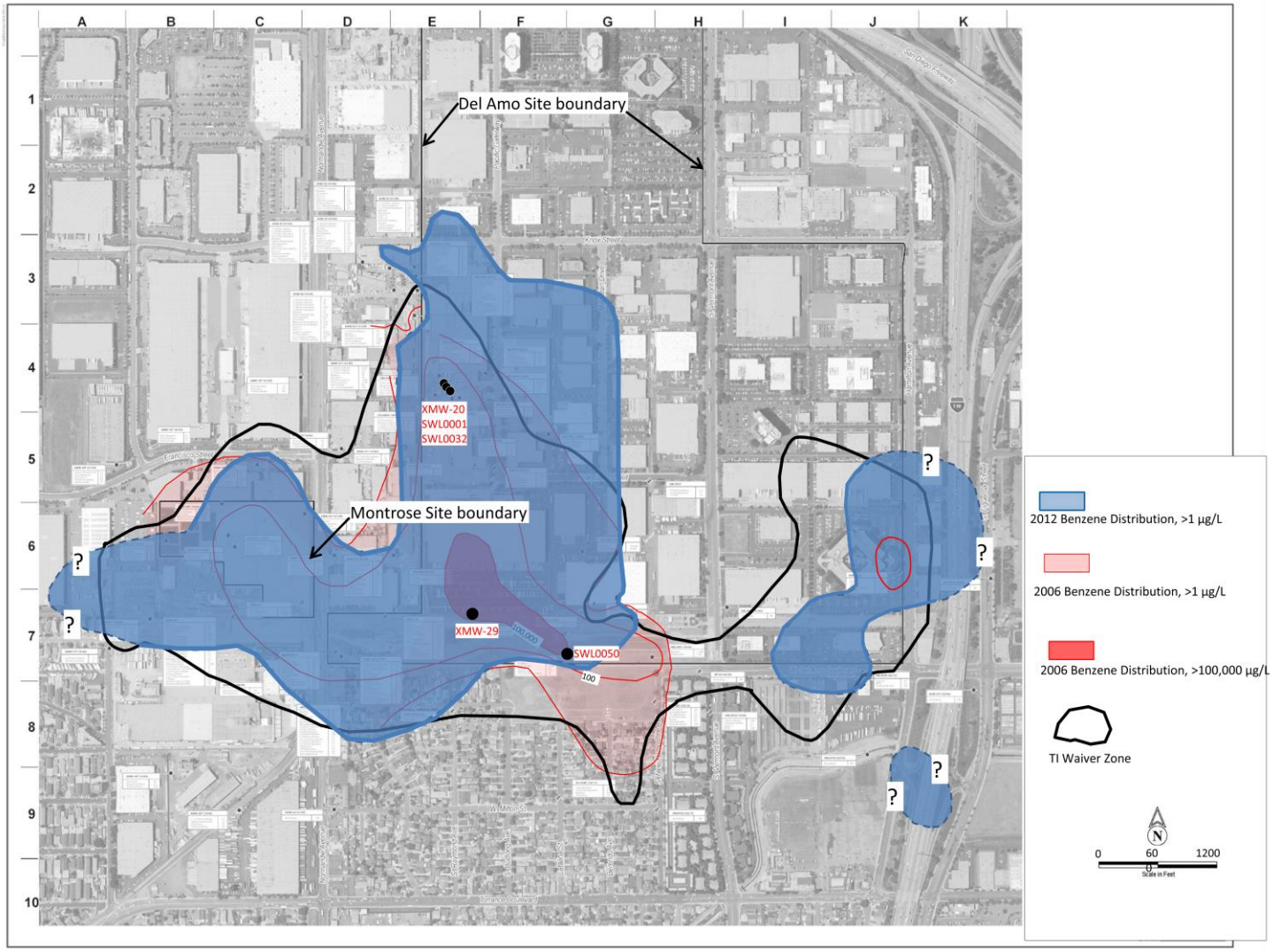

Figure 6-6 Comparison of 2006 with 2012 Dissolved Benzene Concentrations, Middle Bellflower B Sand (MBFB).
Source: URS, 2005; CH2MHill, 2012.

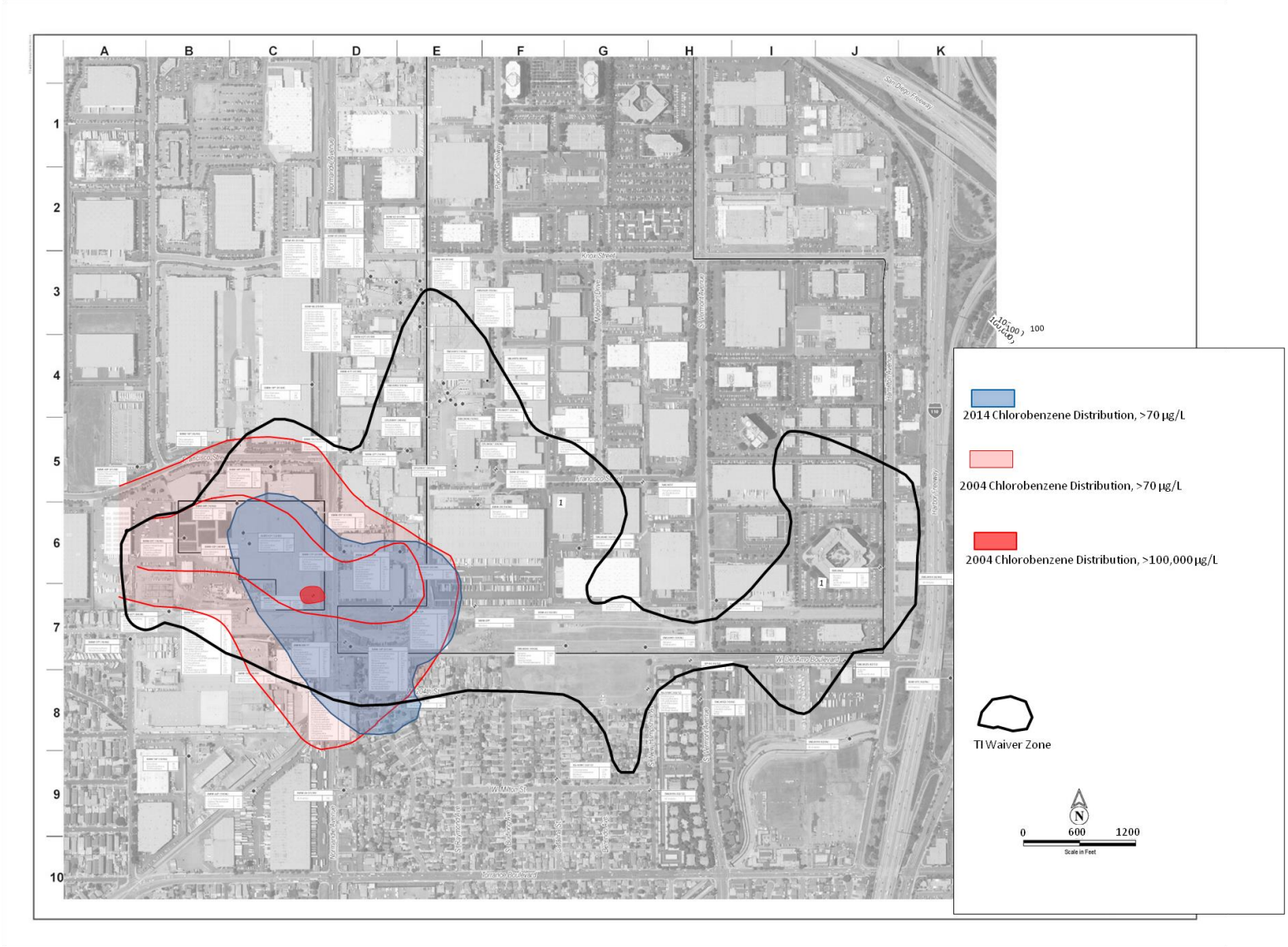

Figure 6-7. Comparison of 2004 with 2014 Dissolved Chlorobenzene Distribution, Middle Bellflower B Sand (MBFB).
Source: URS, 2005 & 2015; AECOM, 2015.

6.4.3.3 Middle Bellflower C Sand (MBFC)

Between 2004 and 2012, groundwater elevations in the MBFC water bearing unit rose approximately 4 to 7 feet, and have generally fluctuated within a half foot to one foot range from 2012 to 2014. 2014 groundwater gradients beneath the Dual Site are minimal, influenced by operation of the Boeing C-6 facility extraction wells to the northwest. However, south of Del Amo Blvd., gradients increase and water levels range from -11.0 ft. amsl (well BF-14) to -13.44 ft. amsl (well BF-36, east of Interstate 110). The natural groundwater flow direction, based on potentiometric head data from 2004, 2012 and 2014 is from north to south/southeast.

- **TCE:** A comparative distribution of the MBFC TCE between years 2006 and 2012 is presented in Figure 6-8. Nine wells were sampled in both 2006 and 2012 and in each of the nine wells TCE concentrations either remained constant or decreased. In 2012, TCE was detected within Dual Site wells CMW002 (150 µg/L) and SWL0054 (1,100 µg/L) and TCE was also detected along the southern boundary of both the Montrose and Del Amo sites (wells, XBF-02, XBF-EW-1, SWL0033, SWL0055, and SWL0018). Although 2012 sample results show that TCE was not detected within wells located outside of the containment zone, there are historical TCE plumes showing contamination emanating from sites located north and northwest of the Dual Site. Historical TCE plume maps prepared in 2004 and 2006 and groundwater monitoring results also suggest possible TCE migration south of the containment zone and towards 204th St. at S. Budlong Ave. Additionally, there appears to be a TCE hotspot centered near Francisco Street and Pacific Gateway on the Del Amo site.

  2014 TCE results, as reported as reported by Montrose (AECOM, 2015) confirm TCE concentrations are stable or decreasing for wells sampled in both 2012 and 2014. One exception is well XBF-02 in the southwestern corner of the Montrose site. Well XBF-02 was historically non-detect, however, in 2014 TCE was detected, but not quantifiable, in this well while well SWL0033 along the southern border remained non-detect for TCE for years 2012 and 2014.

- **Benzene:** A comparative distribution of benzene in the MBFC for 2006 and 2014 is illustrated on Figure 6-9. Benzene, likely associated with the Del Amo site, occurs in three, and possibly four, plume areas. The plume is centered near the southwestern area of the Del Amo property. This plume is inferred to be associated with the overlying plume in the water table and MBFB, and it also appears to extend into the Gage aquifer. The primary area of contamination for this plume is evident at well SWL0065 where dissolved benzene concentrations have ranged from 190,000 µg/L (2006) to 95,000 µg/L (2012) to 470 µg/L (2014). A second, small benzene plume occurs along the southern boundary of the plant site within the waste pits site. This plume is confined to a relatively small area and concentrations at well SWL0040 have ranged from 49,000 µg/L (2004) to 17 µg/L (2012) to 4,700 µg/L (2014). These Del Amo site plumes are confined to the MBFC containment zone.

  A third benzene plume occurs along the eastern boundary of the property near and is identical to the plume shown for the MBFB in this area since the well located near Hamilton Ave (SWL0060) is

considered to be both an MBFB and MBFC well. Benzene concentrations at this well increased to 240 µg/L in 2014. This benzene plume is outside the MBFC containment zone.

A possible fourth dissolved benzene plume may exist in the MFBC east of the Waste Pits and southwest of well SWL0060. As discussed in Section 6.4.2.1, elevated benzene (330,000 µg/L) was detected at PZL0013 within the UBF (Figure 7, URS, 2015), since there are no wells screened at this location in the underlying water bearing units MBFB and MBFC, vertical transport of benzene into this unit may be occurring. This location would also be outside of the containment zone.

Benzene commingled with the chlorobenzene plume extends over the southwestern corner of the Del Amo site and is inferred to emanate from the Montrose property based on the plume position, groundwater flow direction, and correlation with the chlorobenzene plume. While benzene concentrations in this plume are relatively low, the plume encompasses a larger area and extends further downgradient compared to the other MBFC benzene plumes, which is believed to be due to the coincident presence of chlorobenzene at high concentrations. The commingled plume is outside the MBFC containment zone.

- **Chlorobenzene:** The chlorobenzene distribution in the MBFC is shown in Figure 6-10. The overall distribution remains relatively unchanged since 2006; however, chlorobenzene concentrations in the downgradient toe of the plume have varied. To the south and southeast, chlorobenzene concentrations appears to have decreased at select locations, including wells BF-22 (240 µg/L [2006] to 4.6 µg/L [2014]), and BF-11 (7,400 µg/L [2006] to 6.1 µg/L [2014]). However, two downgradient wells, BF-17 and BF-12, located east/southeast of the Kenwood Drain, have shown chlorobenzene increases since 2006. In well BF-17 chlorobenzene increased from 3,800 µg/L (2006) to 4,900 µg/L (2014) and in well BF-12 chlorobenzene increased from 580 µg/L (2006) to 2,300 µg/L (2014). Chlorobenzene is the most prevalent VOC in the MBFC given its relatively high concentrations and wide distribution.

- **pCBSA:** The pCBSA distribution within the MBFC is presented in Figure 6-11. In 2014, pCBSA groundwater concentrations exceed 80,000 µg/L at several sampling locations within, and southeast, of the Montrose site and are higher than those reported in 2006 (CH2M, 2007). pCBSA concentrations have also increased at many other downgradient locations since 2006, including wells BF-20, BF-21, SWL0033, BF-23, SWL0027, and BF-12. Additionally, pCBSA concentrations have increased at one location upgradient of the Montrose site, well BF-35; and two other upgradient wells CMW001 and CMW002 were also detected for pCBSA in 2014 at values of 32,000 µg/L and 57,000 µg/L, respectively. Wells CMW001 and CMW002 were not sampled in year 2006. To the south, 2014 pCBSA results were lower at wells BF-29, BF-16 and BF-11 near the plume toe, but increased at BF-21, BF-22 and BF-30, located northwest and southwest of the Kenwood Drain. Lastly, as was depicted in the MBFC chlorobenzene distribution, pCBSA has increased at well BF-12, east of the Kenwood Drain. This suggests that there is an easterly flow gradient from the Kenwood Drain area towards Interstate 110.

- **Other VOCs:** Other VOCs have been found at elevated concentrations in groundwater in the MBFC water bearing unit HSU. Beneath and in the vicinity of the Montrose site, these VOCs are similar to those found in the UBF/MBFB and include carbon tetrachloride, chloroform, 1,1-dichlorobenzene, TBA, and PCE, As in the UBF, beneath and in the vicinity of the Del Amo site, these VOCs include ethylbenzene, naphthalene, toluene, xylenes, TBA; and the TCE degradation products of 1,1-DCE. Cis-1,2-DCA. The magnitude and extent of most of these other VOCS is fairly defined; however, TBA in the southeastern corner of the Del Amo site is poorly defined. The well coverage in this area of the Dual Site is insufficient to evaluate TBA. The only well in this area of the site (SWL0060) only partially intersects the MBFC and it contained 160,000 µg/L TBA in 2014. Additional wells may be needed to fully delineate the extent of TBA in this area of the Dual Site.

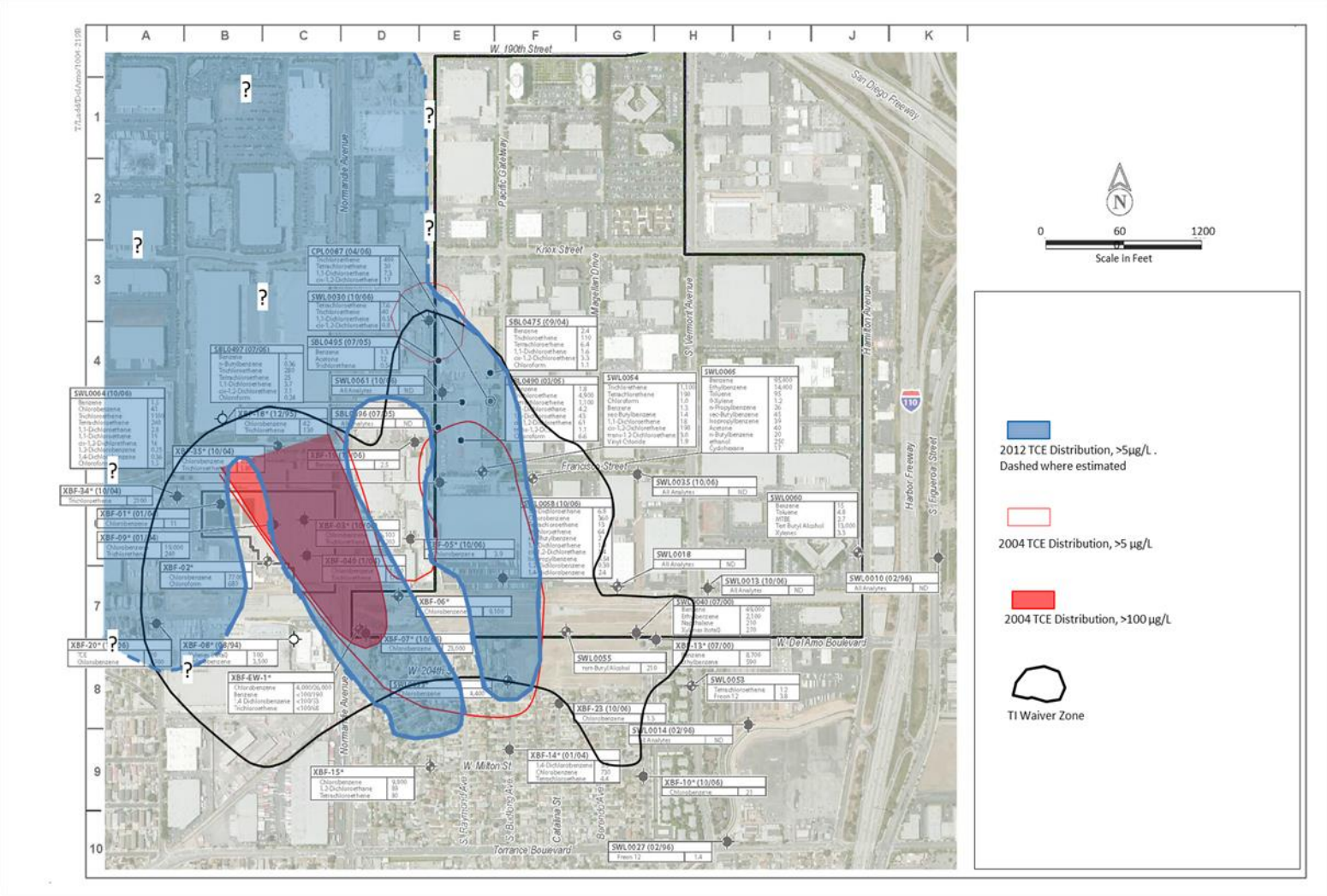

Figure 6-8. Comparison of 2004 with 2012 Dissolved TCE Distribution, Middle Bellflower C Sand (MBFC) Aquifer.
Source: URS, 2005 & 2012; AECOM, 2012.

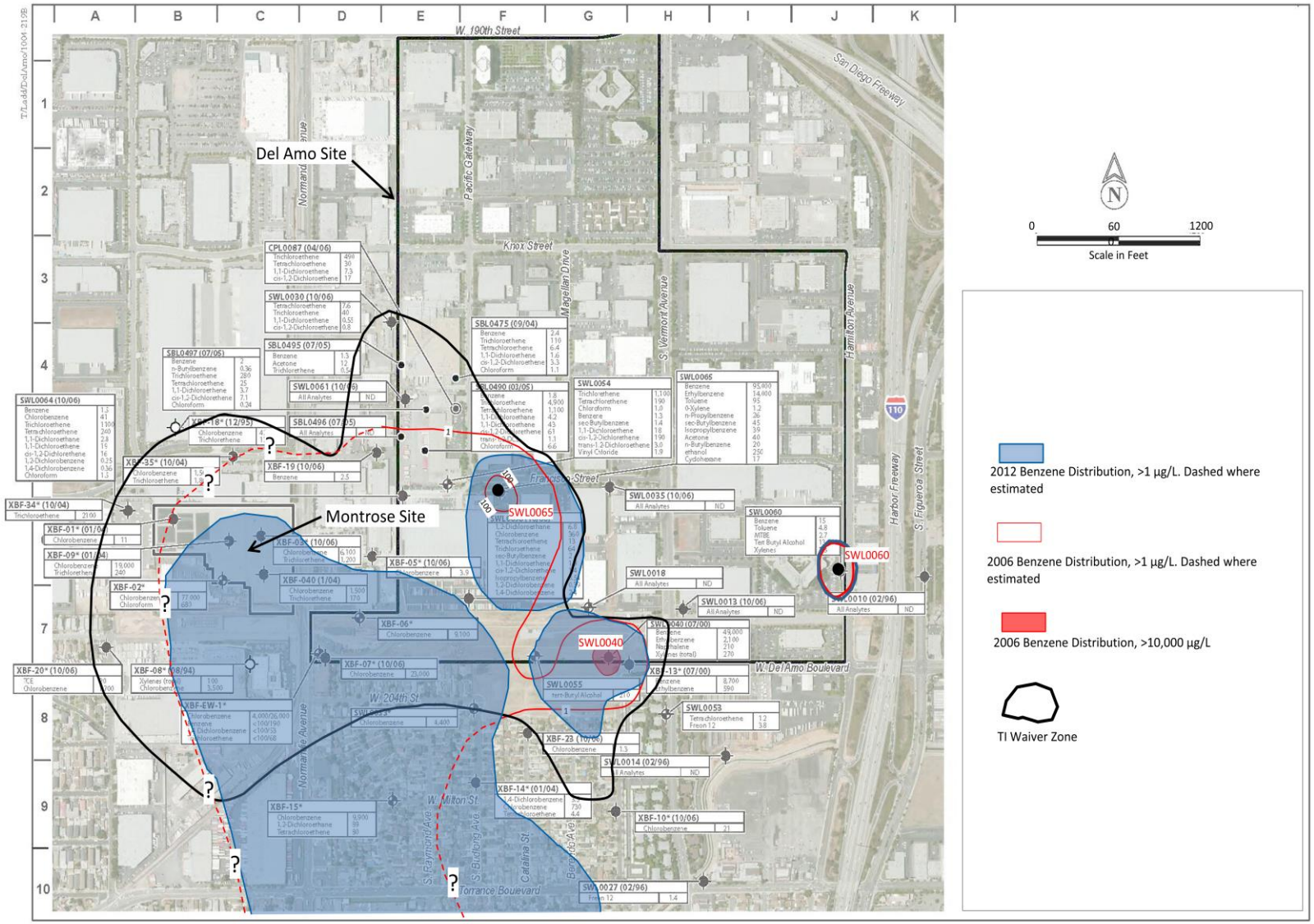

Figure 6-9. Comparison of 2006 with 2014 Dissolved Benzene Distributions, Middle Bellflower C Sand (MBFC).
Source: URS, 2005 & 2015; AECOM, 2015.

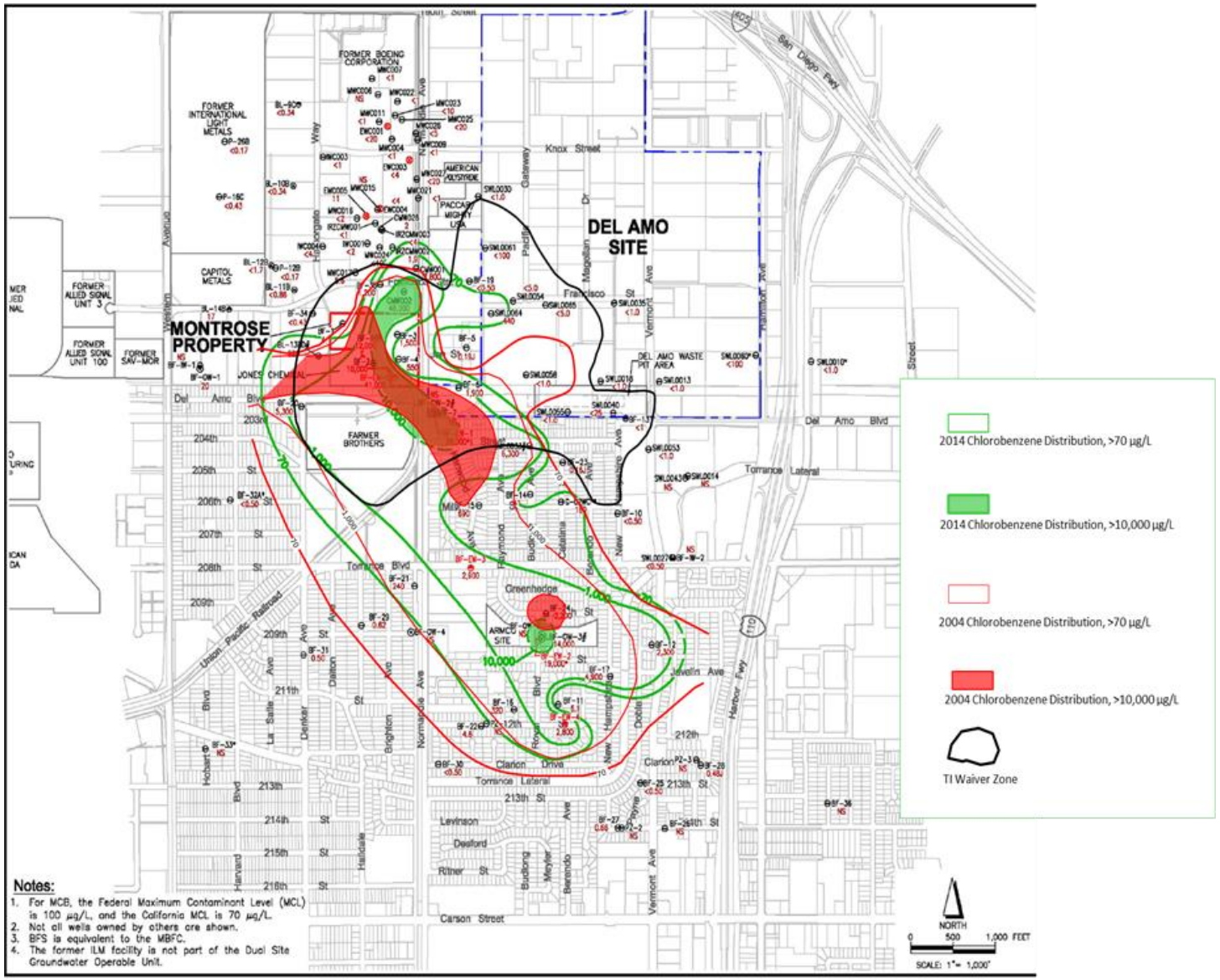

Figure 6-10. Comparison of 2004 with 2014 Dissolved Chlorobenzene Distribution, Middle Bellflower C Sand (MBFC).
Source: URS, 2005 & 2015; AECOM, 2015.

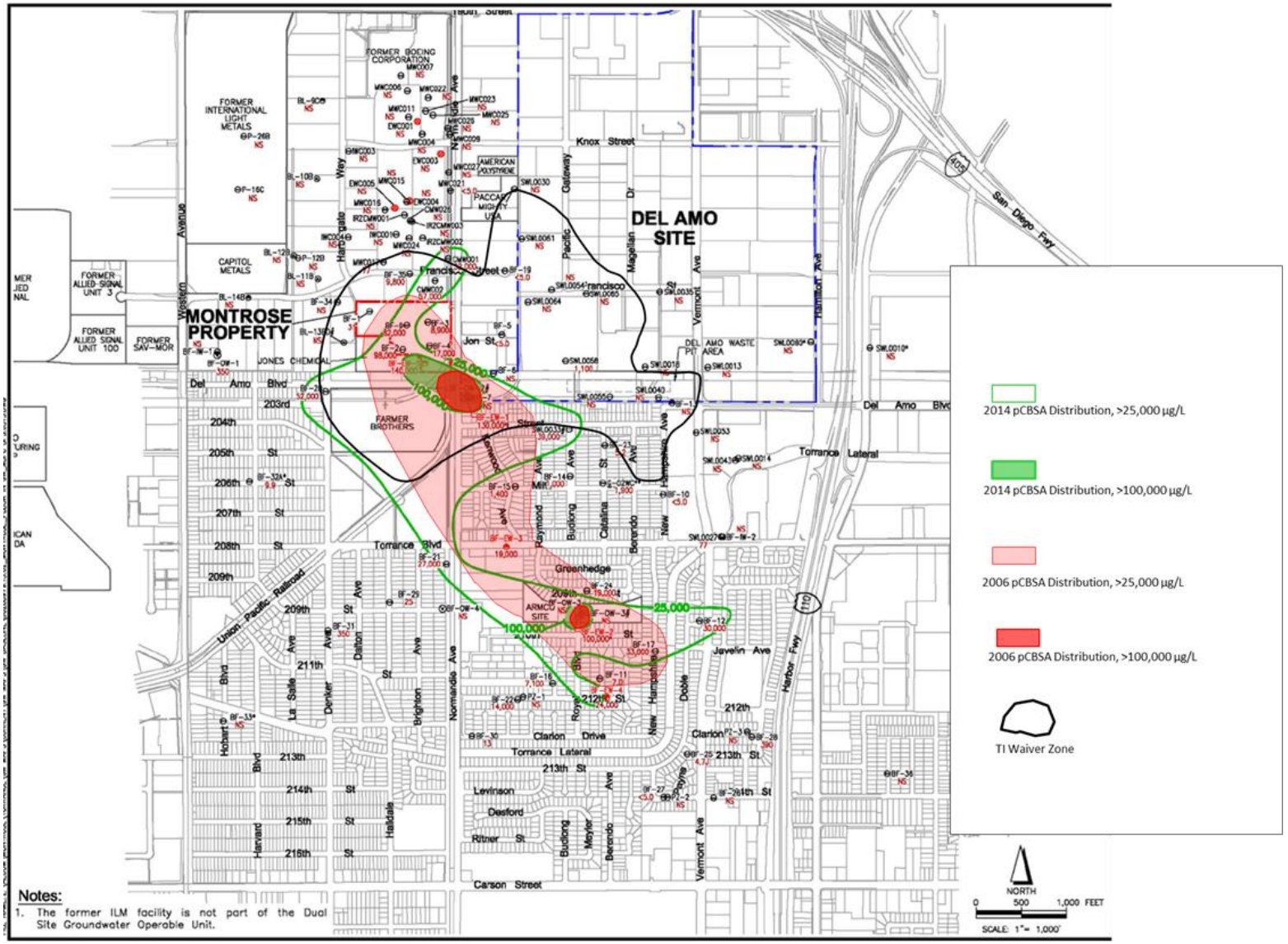

Figure 6-11. Comparison of 2006 with 2014 pCBSA Distributions, Middle Bellflower C Sand (MBFC).
Source: AECOM, 2014; Hargis + Assoc. 2007.

6.4.3.4 Gage Aquifer

The Gage Aquifer is a confined drinking water unit occurring at a depth of between 140 and 200 feet below the ground surface at the Dual Site, and it has exhibited the greatest lateral contaminant migration. The general groundwater flow direction is toward the east and southeast with a relatively flat gradient of between about 0.002 to 0.0005, with increase in gradient occurring in the direction of groundwater flow (AECOM, 2012; URS, 2015). A moderate downward vertical gradient is estimated at about 0.07 between the Gage Aquifer and overlying MBFC.

The hydraulic parameters observed for the Gage Aquifer have not appreciably changed in the past 10 years, with the exception of a rise in the groundwater surface that has affected all water-bearing units at the Dual Site. Groundwater elevations in monitoring wells in the Gage Aquifer rose approximately 5 feet from 2001 to 2009, and has generally fluctuated within one foot from 2009 to 2014.

- **TCE:** The current TCE plume in the Gage Aquifer at the Dual Site above ISGS (5 µg/L) is situated in the southwestern portion of the Del Amo site (Figure 6-12). The elevated concentrations upgradient of the Dual Site and the configuration of the plume boundary are consistent with a primary offsite source for this contaminant. The extent and magnitude of TCE (and degradation products) impact from upgradient sources is not fully evaluated due to the lack of data in the upgradient source areas. Most of the TCE impact to the Gage Aquifer is found outside of the contaminant zone.

  Generally, TCE concentration in the Gage Aquifer appear to have decreased between 2004 and 2014 (Figure 6-12). The apparent decrease in extent and concentration of TCE may be an artifact of additional data points since more wells were installed in the aquifer over the past 10 years. However, TCE concentrations in wells located within or near the Dual Site that have at least a 10 year monitoring history appear to show a decreasing trend. For instance, just east of the Montrose site at well G-4 the TCE concentrations were 120 µg/L in 2004, 95 µg/L in 2006, and 3.8 µg/L in 2014 (Hargis & Associates 2004, URS, 2015). Similarly, north of the Montrose site well G-21 showed 750 µg/L in 2004 and 380 µg/L in 2014. However, locally TCE concentrations may exhibit increases, for example well SWL0066 installed within the southwestern portion of the Del Amo site showed 300 µg/L in 2006 and 930 µg/L in 2014. This indicates that movement of TCE is variable and could still be moving into the Dual Site from upgradient sources.

  The primary source of TCE contamination appears to be upgradient of the Dual Site as evident by the decreasing concentrations of TCE in the downgradient direction at the Dual Site. The greatest current concentration associated with the Gage Aquifer TCE plume is found at the Boeing facility, where well MWG-04 exhibited 1,100 µg/L in 2014. The Boeing facility has extraction wells in operation, but it's uncertain how much of the TCE plume is contained on their property and what portion of the plume may still be moving into the Dual Site. The majority of the Gage TCE plume is outside of the containment zone. The TCE plume in the Gage is generally less than 300 µg/L and has been relatively stable since 2004. The ROD states that "TCE contamination outside the chlorobenzene plume which may exist in the Gage Aquifer is not considered part of the TCE plume and will be addressed

separately." Current data suggests that much of the TCE plume located in the Gage Aquifer beneath the Dual Site is located outside the containment zone and outside of the chlorobenzene plume; therefore, a large portion of the TCE plume at the Dual Site may not be addressed by the Dual Site Groundwater Extraction and Treatment System (GWETS).

- **Benzene:** Benzene is also present in the Gage Aquifer outside of the containment zone. The current distribution of benzene in the Gage Aquifer is illustrated in Figure 6-13 which shows two distinct plumes reflecting two distinct sources of benzene. The southerly plume extends over a larger area and further downgradient, and this benzene is coincident with elevated chlorobenzene. This plume contains relatively low levels of benzene and is fully delineated (URS, 2015). The northern plume is located beneath the Del Amo site and it appears to be smaller in extent and contains benzene at greater concentrations (420 µg/L). The source of benzene in the Del Amo plume is likely downward migration of benzene from the overlying impacted MBFC. While limited in extent, the plume beneath the Del Amo site is not fully delineated (URS, 2015). Both the plume associated with the Del Amo source and most of the plume coincident with chlorobenzene are located outside of the containment zone.

- **Chlorobenzene:** Chlorobenzene has significantly impacted the Gage Aquifer and the plume above ISGS extends about 4,000 feet downgradient to the southeast (Figure 6-14). The plume appears to have two elevated core areas; one beneath and immediately downgradient of the Montrose property, the other situated beneath the residential area 2,000 feet southeast of the site. It is likely that the contaminant mass in the elevated downgradient plume core entered the Gage Aquifer via discontinuities in the overlying aquitard. Although the extent of plume is stable to decreasing, the full extent of chlorobenzene in the Gage Aquifer has not been fully delineated. For example, no data are available for the area southwest of 211th St. and Dalton Avenue. Additional data may be needed to fully evaluate the extent of chlorobenzene in the Gage Aquifer.

- **pCBSA:** The dissolved pCBSA plume illustrated n Figure 6-15 is the most extensive contaminant observed in the Gage Aquifer. There is no groundwater cleanup standard or ISGS for pCBSA. A contour value of 25,000 µg/L is currently used by Montrose that was derived from the maximum injection concentration specified in the ROD. As shown in Figure 6-15, the pCBSA plume greater than 25,000 µg/L is found beneath the Montrose site and extends approximately 2,000 southeast (downgradient). The extent of pCBSA greater than 1,000 µg/L has migrated over 6,000 feet downgradient to the southeast and over 2,000 feet to the southwest (cross-gradient). Based on the reports reviewed the total extent of pCBSA impact to the Gage Aquifer is not fully delineated. pCBSA appears to be quite mobile in the Gage Aquifer as evident by the significant degree of variability in historic concentrations. For example, at the Montrose site and southeast/south of the Dual Site, wells LG-2, G-5, G-9, and G-18 have exhibited a significant increase in pCBSA levels; whereas, wells G-25 and G-24, located more than 800 feet south of the Montrose site, have exhibited a significant decrease. Increases in pCBSA concentrations in the downgradient portion of the plume are of concern (e.g. G-29 that showed 7,800 µg/L in 2012 and 11,000 µg/L in 2014) as is the lack of information on the extent of pCBSA impact in the Gage Aquifer in areas to the west, southwest, and

east of the plume. Additional data may be needed to evaluate plume dynamics in the downgradient portion of the pCBSA plume and to define the total extent of impact to the aquifer.

- **Other VOCs:** VOCs detected in the Gage Aquifer primarily include the breakdown products of TCE; 1,1-DCE, cis-1,2-DCA, and 1,1,-DCE. These VOCs are generally found coincident with the TCE plume beneath the Del Amo site. TBA has been detected in the Gage in G-03 at Montrose (9.3 µg/L) and at the Water Pits at Del Amo (6.8 and 13 µg/L) below the California Notification Level of 12 µg/L. However, there appears to be no data at or downgradient of the Butadiene Plancor for the Gage Aquifer. Additional monitoring wells may be needed in the southeastern portion of the Del Amo site beneath the overlying TBA plume to evaluate the presence of TBA in the Gage Aquifer.

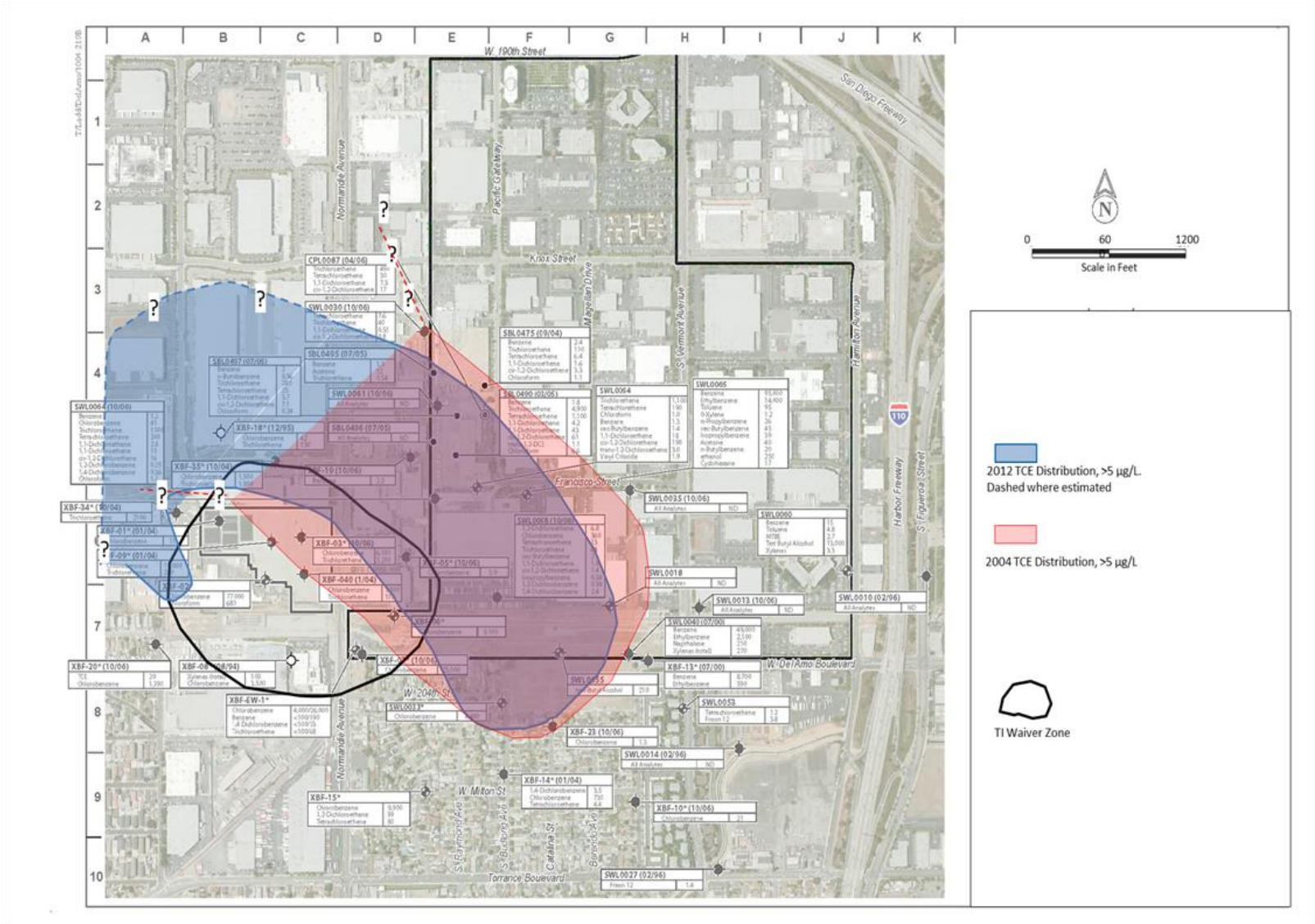

Figure 6-12. Comparison of 2004 with 2012 Dissolved TCE Distributions, Gage Aquifer

Souce: URS, 2005 &2012; CH2MHill, 2012

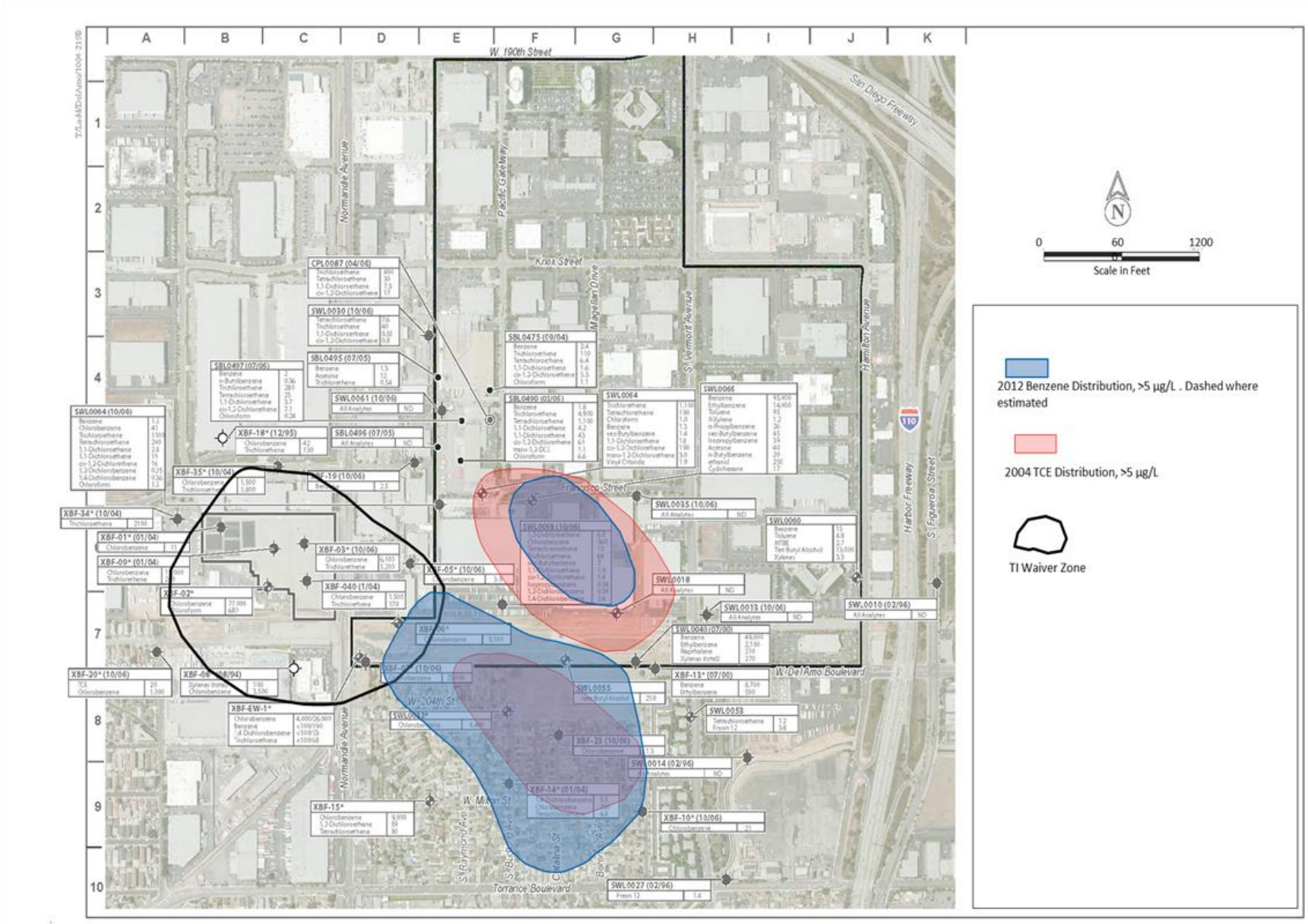

Figure 6-13. Comparison of 2004 with 2012 Dissolved Benzene Distributions, Gage Aquifer.
Source: URS, 2005 & 2012; CH2MHILL, 2012.

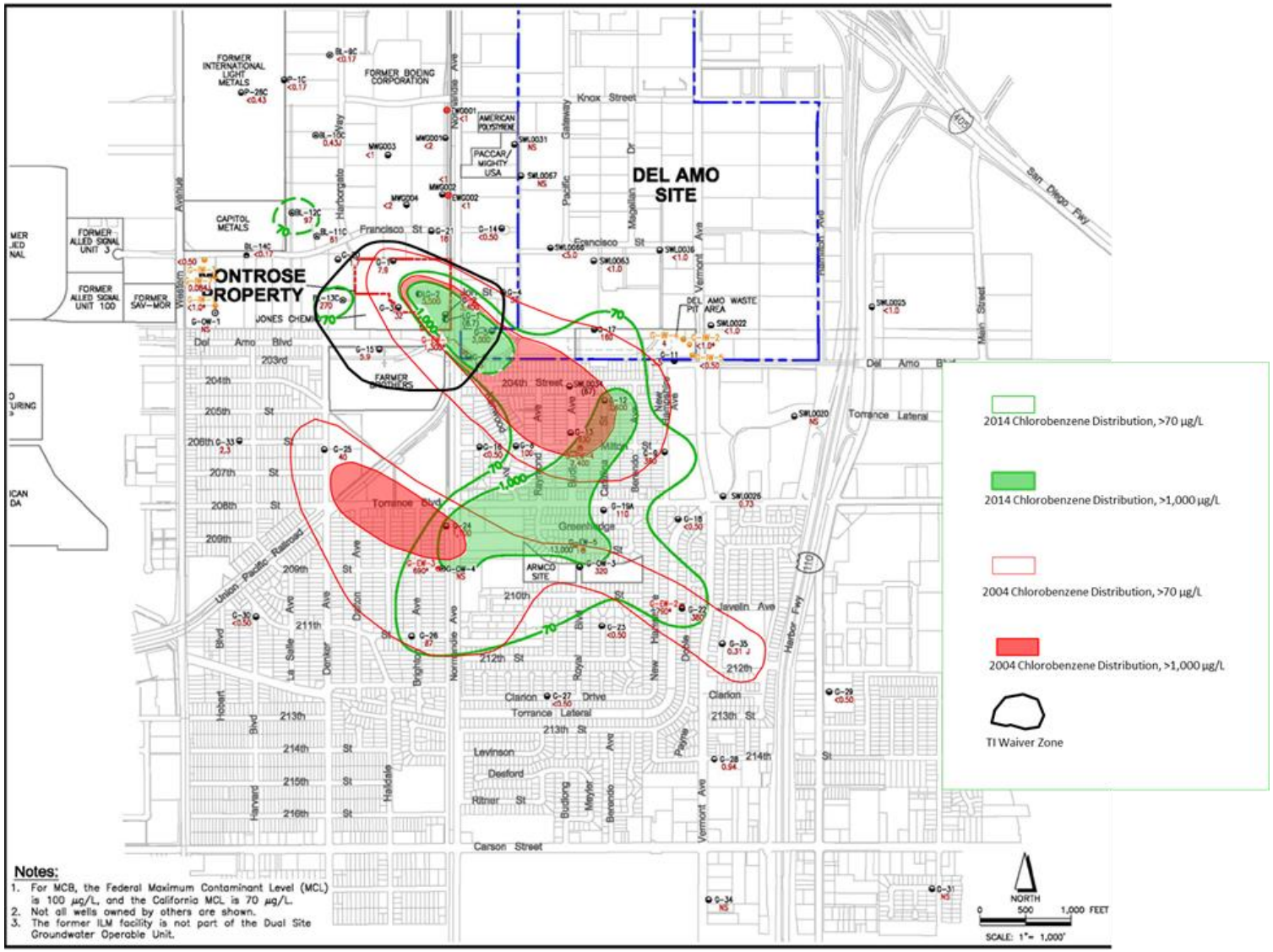

Figure 6-14. Comparison of 2004 with 2014 Dissolved Chlorobenzene Distribution, Gage Aquifer.
Source: URS, 2005 & 2015; AECOM, 2015.

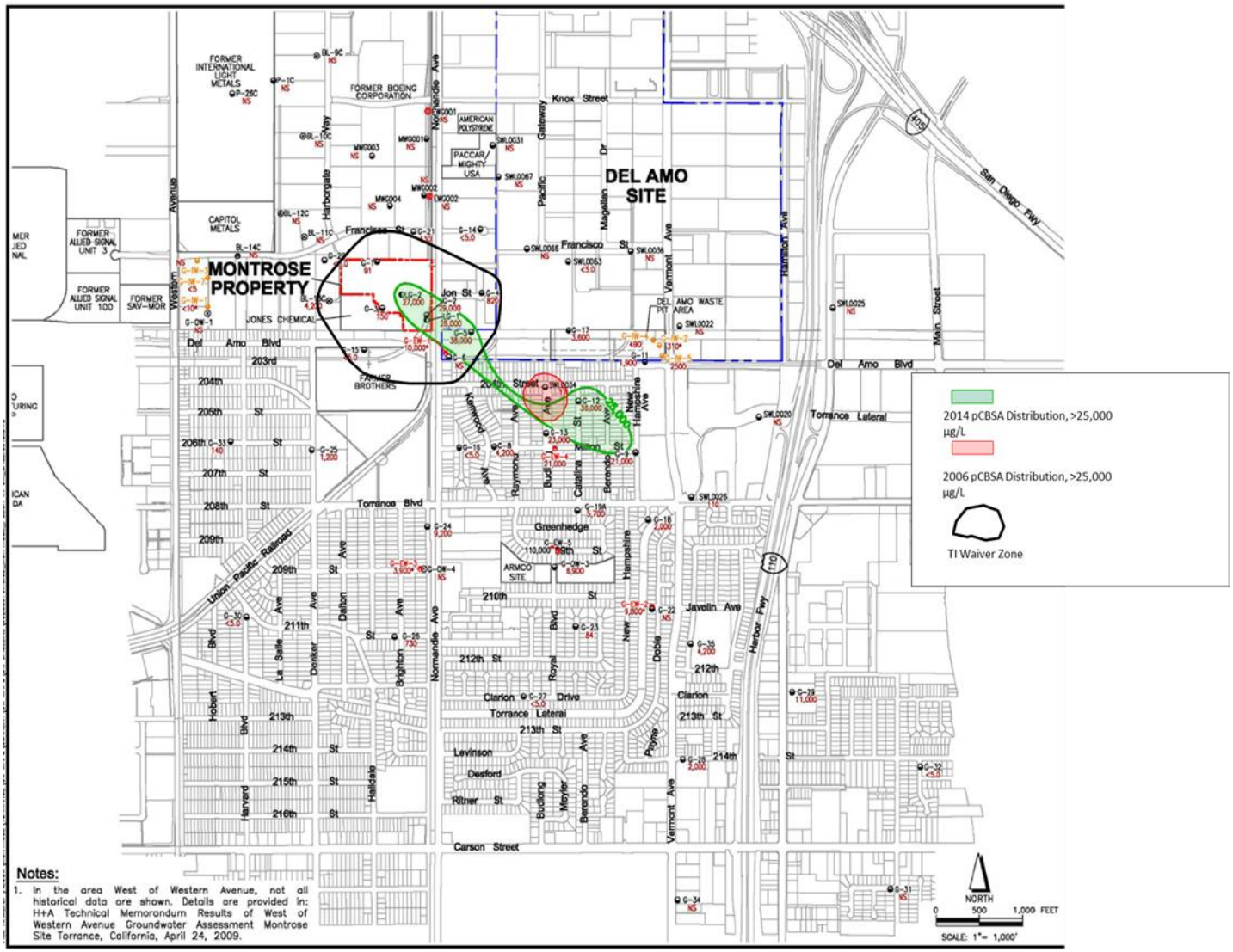

Figure 6-15. Comparison of 2006 with 2014 pCBSA Distributions, Gage Aquifer.
AECOM, 2015; Hargis + Assoc, 2007.

6.4.3.5 Lynwood Aquifer

Only six monitoring wells have been installed in the Lynwood aquifer in support of investigations at the Dual Site. These wells are all located beneath or in the immediate vicinity of the Montrose site. The Lynwood Aquifer is confined by the overlying Gage-Lynwood Aquitard. Groundwater flow appears to be to the northeast with a gradient of 0.0001 (AECOM, 2015). A vertical gradient between the Gage and Lynwood Aquifers of 0.14 to 0.2 was reported by AECOM (2015). Similar to other HSUs at the Dual Site, the groundwater surface elevation rose about 5 feet between 2001 and 2009, and since then has exhibited a minor rise. There is no TI Waiver Zone for the Gage-Lynwood Aquitard and the Lynwood Aquifer.

- **TCE:** Recent sampling results taken in 2014 have not shown any detectable levels in TCE.

- **Benzene:** Recent sampling results taken in 2014 have not shown any detectable levels of benzene. No wells have been installed in the Lynwood Aquifer beneath the footprint of the benzene impact in the Gage Aquifer at the Del Amo site.

- **Chlorobenzene:** Historically (1990-95) chlorobenzene was found in the Lynwood, however, since that time all detections have been below the water quality standard (70 µg/L). Recent sampling conducted in 2014 found levels below 5 µg/L at all six monitoring wells.

- **pCBSA:** In 2014, pCBSA was sampled at six monitoring wells located on or near the Montrose property. The highest concentration was 780 µg/L. This well was resampled and the pCBSA concentration was 130 µg/L. The extent of pCBSA impact to the Lynwood have not been determined.

- **Other VOCs**: No other VOCs are reported in Lynwood Aquifer.

6.4.4. Indoor Air

In 2012, EPA began an assessment of the VI pathway at the Dual Site based on multiple justifications: advances in science, changes in site conditions, and recent re-evaluation of EPA policy on VI. Also, a portion of the TI Waiver Zone (or Containment Zone) underlies the residential area south of the Del Amo Superfund site (see Figure 4-2). The following phased approach was developed by EPA for re-characterization and reassessment of the VI pathway.

- Phase 1 – Gather information from multiple groundwater monitoring sources and various assessment and modeling reports.
- Phase 2 – Perform VI modeling and evaluate results to provide an assessment of data gaps, uncertainty, and weaknesses in the ability to quantify the risks from this pathway through a two-step process.
- Phase 3 – Develop a detailed plan to collect specific information necessary to further evaluate the VI pathway.
- Phase 4 – Implement the plan and report the results with interpretation.

Phase 1 was performed in 2013 and recommended several areas for further evaluation, including occupied residential and commercial buildings that overlie the commingled plumes, specifically:

- Area 1 – Residential area southeast of the Montrose site (with elevated concentrations of chlorobenzene and TCE in the water table)
- Area 2 – Commercial/industrial area with elevated TCE concentrations in the water table south of Montrose and Jones sites
- Area 3 – Residential area south of the Del Amo Site Waste Pits (with historical detections of TCE in the water table and expressed community interest in reevaluation of previous investigations)

Phase 2 was performed in 2014 and concluded that several lines of evidence appear to indicate that the VI pathway warrants additional characterization and further assessment at all three areas of potential concern. Screening evaluations conducted in Phase 2 indicated that off-site groundwater concentrations may have a potential for a complete VI pathway in off-site buildings and recommended confirmation indoor air sampling begin at homes and businesses within 100 feet of wells with concentrations that exceed the most stringent screening levels.

Meanwhile, groundwater sampling from Well #49, which is located on 204th Street in the residential area, began to show increasing concentrations of chlorobenzene and TCE starting in 2012. The concentration of chlorobenzene was 2,900 µg/L in 2012, and as high as 12,000 µg/L in January 2014. Concentrations of TCE also rose from about 100 µg/L to 200 µg/L during the same timeframe. Well #49 is screened in the shallow aquifer located about 50 feet below ground surface.

In June 2015, EPA finalized its guidance to identify and consider key factors for assessing the potential for vapor intrusion, *OSWER Technical Guidance for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air* (OSWER Publication 9200.2-154). As a first step in assessing potential for vapor intrusion, groundwater sampling data can be compared to the groundwater Vapor Intrusion Screening Levels for volatile compounds. The Vapor Screening Levels for chlorobenzene and TCE are 410 µg/L and 1.2 µg/L, respectively. The results from sampling at Well #49 indicated the need for indoor air sampling.

Phase 3, in the form of a sampling and analysis plan for indoor air sampling[1], was completed in November 2014. The COCs for the VI pathway identified in the sampling and analysis plan included: TCE, PCE, benzene, cis- and trans- DCE, vinyl chloride, 1,1-dichloroethane, and1,1-DCE, 1,4-dichlorobenzene, chlorobenzene, chloroform, and 1,1,2-TCA.

The sampling and analysis plan provided project data quality objectives in order to assess the next steps after sampling results are received. These next steps are:

- If indoor air concentrations are consistent with background outdoor levels for Site COCs, no further action will be taken.
- If indoor air concentrations are above background outdoor levels[2] (and it is determined that those concentrations are not caused by indoor or outdoor sources), the residence will be carried to the

[1] The sampling and analysis plan also included outside sampling to determine background outdoor levels.
[2] The 95 percent upper confidence limit (95UCL) of outdoor air sample results will be considered the background outdoor level.

2nd phase of the indoor air investigation. EPA will take appropriate response action to prevent or reduce levels of exposure to below the cleanup levels.

- If indoor air concentrations exceed indoor air screening levels for long term exposure (and it is determined that those concentrations are not caused by indoor or outdoor sources), then appropriate response action will be taken to prevent or reduce levels of exposure to below the screening levels.
- If indoor air concentrations of TCE exceed the interim short term removal action level of 2 $\mu g/m^3$, EPA will take prompt action to prevent further exposure of building occupants and to reduce TCE indoor air levels to below screening levels.

Interim response actions could include any of the following: increased ventilation, building pressurization, sub-slab or sub-membrane ventilation, and filtration. Figure 6-15 shows the decision tree to be followed based on the indoor air results.

An addendum to the sampling and analysis plan for sub-slab sampling – that is, sampling in the area beneath the slab-on-grade – was produced in March 2015 by EPA. The decision criteria for sub-slab sampling results is as follows: if these results are greater than 33 times indoor air screening levels for a particular compound, then the potential for VI is high enough that the home may require additional monitoring or mitigation.

Phase 4 is currently in progress. EPA issued a factsheet requesting permission from residents within Areas 1 and 3 to sample the air inside their homes. Sampling of sub-slab soil vapor in some residences was also performed. Indoor air and sub-slab sampling was conducted beginning in February 2015 within the area bounded by Milton Street on the south, New Hampshire Avenue on the east, and Normandie Ave on the west, and Del Amo Superfund Site on the north.

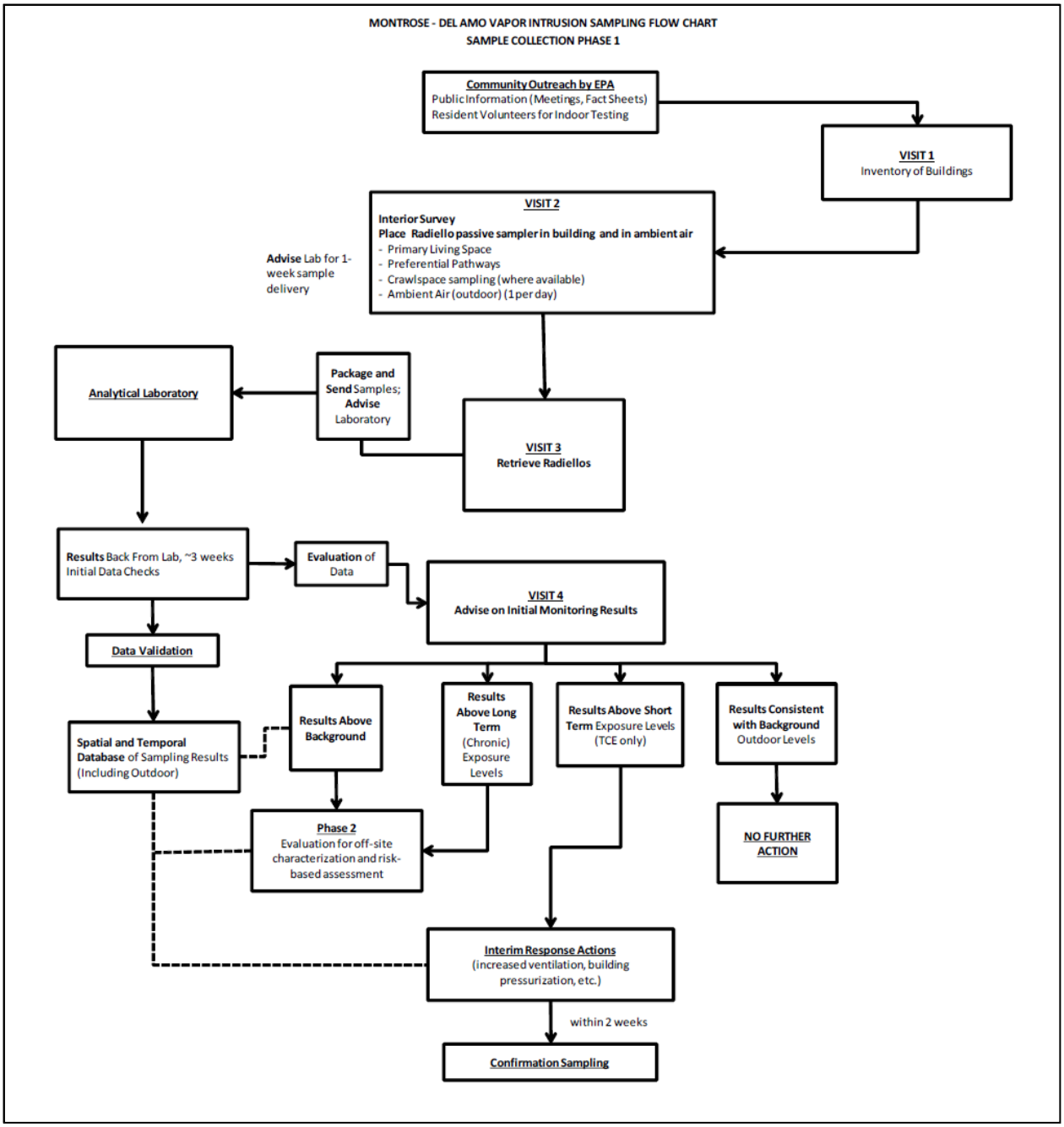

Figure 6-16. Indoor Air Sampling Decision Tree

Figure 6-17. Indoor Air Sampling Areas Sampled in 2015

107 residential units were sampled for indoor air for a total of 340 samples. Of these 107 residential units, EPA collected sub-slab samples from 6 of them and outdoor air samples from 38. Table 6-3 presents the number of samples that exceeded the RSLs for indoor air. Cis- and trans-DCE, 1,1-dichloroethane, and vinyl chloride were not detected in any sample.

Table 6-4. Indoor air result comparison

Contaminant	Number of samples greater than the indoor RSL	Maximum indoor air concentration (µg/m^3)	95 UCL Outdoor air concentration, if available[1] (µg/m^3)	Indoor Air Level of Concern (µg/m^3)
PCE	21	8.4	0.188	0.50[4]
TCE[3]	8	**4.9**	0.053	0.48[2]
1,1,2-TCA	0	NA	NA	0.18[2]
1,2-DCA	184	**15**	0.104	0.11[2]
1,4-DCB	41	**220**	0.156	0.26[2]
Benzene	209	**4.0**	1	0.36[2]
Carbon tetrachloride	27	**0.76**	0.373	0.47[2]
Chlorobenzene	0	0.15	NA	52[2]
Chloroform	205	**5.2**	0.173	0.12[2]

1 – This is the outdoor air concentration at the same location as the maximum indoor air concentration.

2 – Indoor air RSLs as of June 2015.

3 – Two samples were greater than the short-term interim removal action level of 2 µg/m^3 See explanation below

4- DTSC-modified Screening Levels (DTSC-SLs) (also called Cal-mod RSLs), are from DTSC-HERO (2015).

NA – not available; Bolded values are greater than indoor air RSLs.

No samples with detections of 1,1,2-TCA and chlorobenzene exceeded indoor RSL levels, meaning that the levels found are considered to be health protective.

Common building materials and household products are the likely sources of contaminants in indoor air, as described below. However, additional characterization and risk-based assessment is required per the decision tree presented in Figure 6-15.

- The indoor air RSL for TCE was exceeded in eight samples. Of these eight samples, two samples were greater than the short-term interim removal action of 2 μg/m^3 at 4 μg/m^3 and 4.9 μg/m^3. Indoor sources of TCE may include household cleaners, greasers, and sealants. The indoor air RSL for PCE was exceeded in 21 samples. This chemical is commonly found in water repellents, silicone lubricants, spot removers, adhesives, and wood cleaners.
- The indoor air RSL for 1,2-DCA was exceeded in over one hundred samples. This chemical is commonly found in products imported from other countries, such as wall coverings, housewares, and automobile parts.
- The indoor air RSL for 1,4-DCB was exceeded in 41 samples. This chemical is commonly found in moth balls, toilet cleaners, and in some fumigants.
- The indoor air RSL for carbon tetrachloride was exceeded in 27 samples. This chemical is commonly found in building materials and older household products such as aerosol cans, fumigants, and refrigerants.

Benzene and chloroform concentrations in over two hundred samples exceeded their respective indoor air RSLs. Benzene and chloroform are common air pollutants throughout the Los Angeles area as discussed below. However, even though the concentrations found in the indoor air may be attributable to indoor and outdoor sources, EPA will continue to assess the potential vapor intrusion pathway by collecting soil gas samples in the area and analyzing information from Dual Site-related contaminants.

Table 6-5 presents the number of samples from the six residences where sub-slab sampling occurred that exceeded the residential sub-slab screening level. Only one contaminant, chloroform, was found at a concentration above the sub-slab screening level; the exceedance was detected in three samples. Per the SAP addendum, additional monitoring or mitigation may be required for the three locations exceeding the sub-slab screening level for chloroform. The reporting limits for some compounds are greater than the screening level.

Table 6-5. Sub-slab result comparison

Contaminant	Number of samples greater than sub-slab screening level	Maximum concentration (μg/m^3)	Sub-slab screening level[1] (μg/m^3)
PCE	0	30	363
TCE	0	ND (10)	15.8
1,1,2-TCA	0	ND (10)	5.9
1,2-DCA	0	ND (10)	3.6
1,4-DCB	0	ND (10)	8.6
Benzene	0	ND (7)	11.9
Carbon tetrachloride	0	ND (10)	15.5
Chlorobenzene	0	ND (10)	1,716
Chloroform	3	**30**	4

1 - Sub-slab screening level is the indoor air RSL times 33(attenuation factor).

ND – non-detect; highest reporting limit shown in parentheses; Bolded values are greater than sub-slab screening level.

EPA calculated the 95 upper confidence (UCL) level for COCs detected in outdoor air, and those are presented in the Table 6-6. As stated above, the 95UCL will represent background concentrations. Of these, the 95UCL for benzene and chloroform are greater than the indoor air RSL. Many indoor air samples were greater than the 95UCL.

Table 6-6. Indoor air results compared to 95UCL of outside air concentrations.

Contaminant	95UCL Indoor Air ($\mu g/m^3$)	95UCL Outdoor Air ($\mu g/m^3$)	95UCL Crawlspace ($\mu g/m^3$)	Indoor Air RSL[1] ($\mu g/m^3$)
PCE	**0.601**	0.188	0.203	0.5[2]
TCE	0.178	0.0503	0.0774	0.48
1,2-DCA	**1.45**	0.104	0.153	0.18
1,4-DCB	**15.68**	0.156	0.566	0.26
Benzene	**1.25**	1	1.041	0.36
Carbon tetrachloride	0.38	0.373	0.371	0.47
Chloroform	**0.718**	0.173	0.223	0.12

1 - Indoor Air RSLs as of June 2015.
2- DTSC-modified Screening Levels (DTSC-SLs) (also called Cal-mod RSLs) are from DTSC-HERO (2015).
Bolded values are greater than the Indoor Air RSLs.

Benzene and chloroform are recognized as contaminants present in ambient air throughout Los Angeles. A possible source of ambient benzene is the Del Amo Site. Further assessment is planned at Del Amo to ensure that it is not contributing to the ambient air concentrations in the neighborhood. A draft 2014 Multiple Air Toxics Exposure Study (MATES) for the South Coast Air Basin was reviewed in an effort to understand air quality in this general area and the associated health risks. The MATES calculated Basin-wide average cancer risk associated with key air toxics. Monitoring sites for this study were generally to the east of the Site (see Figure 6-17). Substances monitored for this study include toxics that pose the most significant contributors to health risks as found in previous Basin studies. Results from the monitoring were used to model cancer risks from the highest contaminant contributors. The draft MATES concluded that diesel particulate was the largest contribution to cancer risk from air toxics. The next three highest contributors included benzene, hexavalent chromium, and 1,3-butadiene.

During the site visit, it was noted that the South Coast Air Quality Management District was conducting air sampling for the month of July 2015 within the residential area south of the Del Amo site to obtain more localized information specific to benzene and chloroform. Final results from the investigation were not yet available at the time of this review. However, on August 31, 2015, SCAQMD presented their preliminary information and concluded the following:

- Results from ambient outdoor measurements conducted in the Harbor Gateway communities during June / July 2015 were typically lower than levels associated with MATES IV (Central Los Angeles); and
- Certain pollutants associated with potential vapor intrusion had levels that were higher and others that were lower than EPA outdoor samples but all were within the range of typical ambient air.

Based on the data set evaluated and in accordance with the decision tree presented in Figure 6-15, additional off-site characterization and risk-based assessment is required because many samples were greater than the 95UCL, which is considered background per the SAP. For the residences where results were consistent with background levels, no further action is needed.

The only Dual Site contaminant with a short-term action level is TCE. For the two residences that had indoor air samples that were greater than the short-term removal action value of 2 µg/m^3 for TCE, EPA resampled, as permitted by the residents, and immediately communicated the results with them. After resampling and/or based on information provided by the residents, EPA concluded that these 2 detections above the short term removal action levels were possibly from an indoor source[3]. Additionally, EPA will work with the property owners to offer additional sampling for these residences.

[3] Indoor sources for TCE may include household cleaners, degreasers, and sealants.

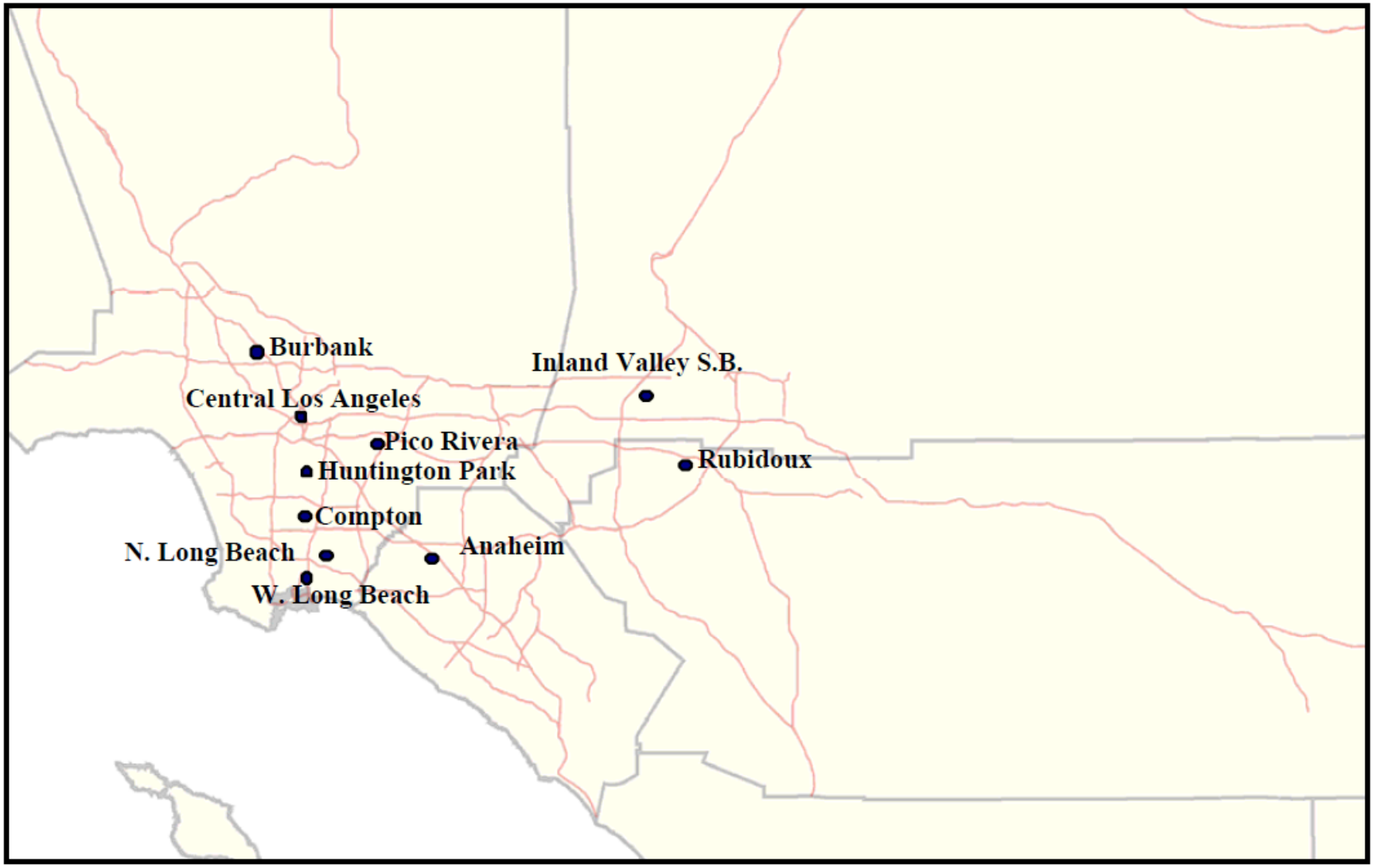

Figure 6-18. 2014 SCAQMD Air Quality Monitoring Sites for MATES

6.5. Site Inspection

A site inspection was conducted on June 19, 2015. Representatives from Montrose, including their contractors, EPA Region 9, and USACE were present. The inspection included a walkthrough of the groundwater treatment plant, which is a component of the Dual Site Groundwater OU remedy and inspection of an extraction well. No injection wells were inspected during this inspection. The groundwater treatment equipment, tanks, and piping were in new condition. The plant is currently in functional testing and has not started operations. The extraction well, EW5, was inspected. This well appeared to be in new condition. A trip report with participants and photos and the site inspection checklist are presented in Appendix D.

6.6. Interviews

During the FYR process, USACE conducted interviews with parties impacted by the Site, including the current and former landowners and tenants, and regulatory agencies involved in Site activities or aware of the Site. The purpose of the interviews was to document community observations regarding the Site and any perceived problems or successes with the phases of the remedy that have been implemented to date. The project coordinator for the groundwater treatment system was interviewed during the Site visit on June 19, 2015. Additional interviews were conducted during a large community outreach event from June 19 – 20, 2015. Following the event, EPA solicited the input of additional community members and stakeholders, several of which provided comments through telephone interviews or via e-mail. Details of the community and stakeholder outreach and complete interview records are provided in Appendix C. Interviews are summarized below.

Mike Palmer (de Maximis) is the project coordinator for Montrose. Mr. Palmer stated that construction of the treatment plant was completed in 2014. Functional testing and equipment shakedowns are in progress, but the plant has not been turned on yet. De Maximis is looking forward to completing the functional testing and shakedowns, and to starting to pump water.

USACE interviewed many Board Members and partners of the Del Amo Action Committee (DAAC), as well as other community members. Written input was received from DAAC, the Water Replenishment District of Southern California, the California Department of Toxic Substances Control (DTSC), and other community members. The primary concerns and suggestions expressed are summarized below:

- The sites and the contamination in the surrounding area are not being looked at holistically and coherently. There needs to be a holistic description of how all of the OUs fit together, and the community needs be informed of the plan. Additionally, there was concern that the constructed Torrance groundwater extraction and treatment system was not designed to address contamination in nearby groundwater plumes from other cleanup sites. Furthermore, those groundwater plumes may impinge on the effectiveness of the treatment system to treat the Montrose/Del Amo groundwater contamination.

- Contamination has moved past where the groundwater model predicted it would. Additionally, the model does not appear to have been calibrated to show other groundwater plumes in the area from other cleanup sites or the interaction of other groundwater treatment systems and/or potential injection scenarios. The groundwater model assumptions should be revisited, and the model should be recalibrated if necessary.

- The pCBSA standard in the ROD is 25 ppm. A new public health protective goal of 3 ppm was recently released by OEHHA in March 2015. Tests have shown that the treatment system will not decrease pCBSA concentrations to even the ROD standard, let alone the new OEEHA goal; the remedy will need to be retrofitted. The current plan is to reinject treated water into an uncontaminated portion of the aquifer. DAAC is trying to prevent the system from being turned on until the pCBSA concentrations of the reinjected water meet 3 ppm.

- The TI waiver zone is a huge problem because of the long remediation timeframes. Based on the feasibility study, the groundwater system will need to operate for over 3,000 years. People live above the TI waiver zone and the groundwater will not be cleaned up in the residents' lifetimes. Contamination will continue to enter groundwater and vapors for many years, and will continue to impact the community and regional water quality. There is no known plan to continue monitoring vapor intrusion into the future. The TI waiver zone should be revisited; community relocation or other remedies, including mass removal, should be considered.

- Working with EPA and getting meaningful information to the community has been difficult. There are so many OUs with different RPMs, and they come and go due to the long-lasting nature of the cleanup. There is little consistency with the people involved; there's a lack of stewardship. EPA provides information in a fragmented manner; there has not been adequate or consistent involvement with the community. Most community members are not well-informed, and those who are have demanded to be. The community information repository is too far from the community, and the information repository and the website do not contain documents or information that is helpful to community members. EPA needs to find more creative and meaningful ways to involve the community and to help community members understand the issues.

- EPA had been previously unresponsive to comments provided by DAAC and others regarding remedy selection and implementation, though some felt that communication had improved recently. Still, stakeholders insist that EPA act in a collaborative way with all stakeholders to move the project ahead. Communication with key stakeholders should include more frequent technical updates and more transparency regarding the remediation design and implementation.

- Residents are very concerned about the cleanup and the site and how it is affecting the health of their current and potential future families. The presence of contamination under homes has a negative impact on the psyche of the residents. Multiple community members indicated that no one informs people of the contamination prior to moving into the area, and that there needs to be some measure to make sure people are informed when considering buying or renting a property in

the area. More than one community member also suggested that the TI waiver zone should be revisited, and that its existence shows that the responsible parties are not being held accountable or have been let off lightly. Several people did not feel well-informed about the Site.

The written submissions are attached at Appendix C.

6.7. Institutional Controls

As described in Section 4.1.2, institutional controls include the continuation of existing restrictions, the issuance of non-interference orders, and well surveys.

Existing restrictions

Existing governmental controls are in place to restrict the installation of drinking water wells within an area with potential contamination hazards.

In the area of the Site, two entities regulate groundwater well installation: the State Water Resources Control Board's Division of Drinking Water (DDW), and Los Angeles County. DDW regulates municipal water companies who service greater than 200 connections under provisions of the Safe Drinking Water Act (SDWA). Under Section 11600 of the California Health and Safety Code, DDW can delegate authority to local primary agencies (LPAs) for public water systems that serve fewer than 200 service connections. Los Angeles County has been designated one of these LPAs. In addition, Los Angeles County also regulates the use of domestic wells under its sanitation and well permitting requirements set forth in the Los Angeles County Code. The Water Replenishment District of Southern California manages water resources to ensure that a reliable supply of high quality groundwater is available for all water users in the Los Angeles area.

Per the California SDWA (Chapter 4 of Part 12 of Division 104 of the Health and Safety Code, State of California), DDW requires a water purveyor to apply for an amended water permit before a new well is constructed and connected to the water system. Before a permit is issued, DDW performs a thorough review of the following elements:

* The location of the well with respect to potential contamination hazards;

* Design and construction of the well necessary to prevent contamination or the exclusion of undesirable water; and

* The bacterial and chemical quality of the water produced.

DDW may then issue a permit depending on its findings.

The well permitting process for Los Angeles County is similar to that of DDW. Therefore, inadvertent construction of drinking water wells within the Site should not occur. There are no domestic water supply wells within the contaminated area; no one is currently drinking the Site groundwater.

Non-Interference Orders

At this time, non-interference orders have not been issued.

Well Surveys

A well survey was conducted in 2003. This survey identified production wells, both active and stand-by, located within an area approximately 0.5 miles cross-gradient and 1 mile downgradient of the extent of the Dual Site groundwater contaminant distribution known at that time. Based on this survey, it appeared one production well located within the survey area was being used for municipal supply purposes and five municipal supply wells were on standby. At the time of the survey, the City of Torrance and the California Water Service Company had no plans to install additional production wells. No recent surveys have been conducted.

7. Technical Assessment

7.1. Question A: Is the remedy functioning as intended by the decision documents?

The remedy selected in the 1999 ROD includes the following components: (1) Contain dissolved phase contaminants in groundwater surrounding the NAPL (TI Zone), through active treatment and monitored natural attenuation; (2) Reduce dissolved phase concentrations of contaminants in groundwater outside the TI Zone to health-based standards; (3) Monitor to confirm remedial action performance; and (4) Implement institutional controls.

Construction of the extraction and treatment system was nearly complete by December 2014, but has not begun operations. The limited functional testing of the treatment plant conducted to date has demonstrated that the system can meet reinjection standards at the average design influent concentrations, but needs various system improvements to operate in the full range required in the design. Actual influent pCBSA concentrations, however, have been significantly above the assumed influent concentrations due to a substantial increase in the pCBSA concentrations at an on-property extraction well. Functional testing is not yet complete.

The biodegradation of benzene, which is a key component of the containment remedy, appears to be occurring. The benzene plume has remained laterally stable in the upper two water bearing units (UBF and MBFB) near the former Del Amo plant property. Biodegradation indicators, combined with the observed benzene distribution and identified trends of decreasing benzene concentrations, suggest that the intrinsic biodegradation is occurring. Additional lines of evidence, such as biodegraders, are typically also used to assess whether intrinsic bioremediation is working. Measurements of biodegraders have not been conducted recently and biodegradation rates were not reported in the most recent groundwater monitoring report.

The ROD selected an active extraction remedy to address the benzene plumes outside the TI Zone in the MBFC and Gage aquifers. This review identified two benzene plumes located outside the Containment

Zone in the MBFC. One benzene plume occurs along the eastern boundary of the former Del Amo plant property in the MBFC near well SWL0060. The second benzene plume may exist to the east of the Waste Pits and southwest of well SWL0060. As discussed in Section 6.4.2.1, elevated benzene (330,000 µg/L) was detected at PZL0013 within the UBF (Figure 7, URS, 2015). However, since there are no wells screened at the same location in the underlying water bearing units (MBFB and MBFC), vertical transport of benzene cannot be confirmed.

The extent of the overall plume footprints of chlorobenzene, TCE and pCBSA have remained generally stable since the first comprehensive sampling events in 2004 and 2006. However, there have been several locations within the comingled plume where concentrations have had unexplained, rapid increases. Notably, groundwater sampling from SWL0049, located at 204th Street within the residential area, began to show increasing concentrations of chlorobenzene and TCE starting in 2012. In 2012, the chlorobenzene concentration was 2,900 µg/L at this well, but was detected at 12,000 µg/L in the January 2014 sampling. Concentrations of TCE also rose from about 100 µg/L to 200 µg/L in that well during the same timeframe.

Groundwater monitoring events were conducted in 2006, 2009, 2012, and 2014. Our review highlighted the need for supplementing the existing groundwater monitoring network to fulfill monitoring objectives identified in the ROD. These include and are not limited to additional monitoring wells to (1) monitor the movement of pCBSA in the Gage and Lynwood to adequately assess injection water containing pCBSA; (2) adequately assess current and future pCBSA distribution down to the non-detectable level; (3) assess benzene emanating from the area of the former butadiene manufacturing facility, and other areas in the southeastern portion of the Del Amo Site; (4) fully delineate chlorobenzene in the Gage; and (5) evaluate the extent of TBA in the MBFB and MBFC and Gage Aquifers.

The remedial actions for pCBSA described in the ROD include defining the full downgradient extent of the contaminant. The limit of the pCBSA plume in each aquifer has not been adequately determined. There are not enough wells to monitor sufficiently the movement of pCBSA in the Gage and the Lynwood units once reinjection begins.

The ROD selected existing restrictions, non-interference orders, and well surveys as institutional controls. Existing restrictions in the form of governmental controls are in place to restrict the installation of drinking water wells within an area with potential contamination hazards. Local regulations require an evaluation prior to the issuance of a permit to install a production well, with the intent of preventing well placement within an area of contamination. A well survey conducted in 2003 identified one production well located within the survey area that was being used for municipal supply purposes and five municipal supply wells that were on standby. No recent surveys have been conducted.

A unified and comprehensive Site Conceptual Model (SCM) has not been developed for the entire Dual Site. The numeric groundwater flow model should be updated to integrate the Montrose and Del Amo conceptual models and include off-site sources and lithology. The model should extend beyond the boundaries of the Dual Site as appropriate to account for all potential receptors.

7.2. Question B: Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives (RAOs) Used at the Time of Remedy Selection Still Valid?

Certain exposure assumptions, toxicity data, and cleanup levels that EPA used at the time of the remedy selection are no longer valid. The RAOs presented in the ROD are still valid, but incomplete because the vapor intrusion pathway was not considered.

At the time of the 1999 ROD, EPA did not consider the possibility of vapor intrusion when evaluating potential exposure to groundwater, and such exposure was therefore not evaluated in the selection of the Dual Site remedy. EPA recently initiated a multi-phased vapor intrusion investigation to determine if residents living above the contaminated groundwater plume just outside the former Montrose Chemical and Del Amo plant properties are affected by volatilizing contaminants from groundwater. In February and March 2015, EPA collected indoor air and sub-slab samples at 107 residential units. Many samples contained contaminants of concern at levels consistent with background or below the screening levels. In the context of this sampling effort, the most widely detected chemicals in indoor air were benzene, chloroform and 1,2-DCA. Benzene and chloroform are also present in the ambient air – that is, the outside air in the neighborhood. Of the eight samples where concentrations for TCE were greater than the indoor air RSL, two samples were greater than the short-term interim removal action of 2 $\mu g/m^3$ (4 $\mu g/m^3$ and 4.9 $\mu g/m^3$, respectively). After resampling and based on information received from the residents, EPA concluded that these two elevated detections were possibly from an indoor source. The vapor intrusion study is continuing.

The contours of the TI Waiver Zone described in the 1999 ROD were established on the basis of EPA's conclusion that – within that zone, where concentrations of NAPL were high – it would be technically impracticable to achieve MCLs in groundwater. Consideration was not given to the potential for vapor intrusion from the shallower groundwater units, especially under the neighborhood to the south of the former Del Amo facility. Based on the information available, it appears that vapor intrusion does not pose an urgent risk. However, if conditions change and concentrations increase, the risk of vapor intrusion may also increase.

Since issuance of the ROD, cleanup standards have changed for several COCs. Chloroform, ethylbenzene and 1,2,4-trichlorobenzene have lower MCLs. For all of these contaminants, their respective cleanup standards are not within the acceptable cancer risk range of 10^{-6} and 10^{-4} and therefore, protectiveness may be affected in the long-term. There have been a few changes to the location-specific and action-specific ARARs identified in the ROD, none of which affect the protectiveness of the remedy.

The ROD identifies California's Anti-Degradation Policy as an applicable requirement for the selected remedy. However, the reinjection of pCBSA at the selected level of 25,000 µg/L will entail some degradation of the receiving aquifer, which currently has low to non-detect levels of pCBSA in the vicinity of the reinjection wells. The Anti-Degradation Policy requires an analysis of potential degradation, which the ROD did not explicitly include. An Anti-Degradation Policy analysis should be conducted before the groundwater treatment system starts full operation.

The compound Tertiary-Butyl Alcohol (TBA) has recently been detected in several wells and is often co-located with benzene plumes. The remedy did not select a cleanup standard for TBA, and the current treatment plant was not designed to treat it.

In 2015, California's Office of Environmental Health Hazard Assessment (OEHHA) re-evaluated its earlier toxicity assessment for pCBSA using the same toxicity studies available at the time of the 1999 ROD, and arrived at a recommendation for a public health protective concentration of 3,000 µg/L. Like a public health goal, a public health protective concentration is based on a risk assessment using the most current methods; however, it does not undergo formal public review or an external scientific peer review. EPA's Superfund Technical Support Center reviewed OEHHA's reassessment, concluded that it was "not reliable," and determined that there is still insufficient information to establish a screening provisional reference values for pCBSA.

7.3. Question C: Has Any Other Information Come to Light That Could Call Into Question the Protectiveness of the Remedy?

No other information has come to light that could call into question the protectiveness of the remedy.

7.4. Technical Assessment Summary

The groundwater treatment plant, integral to the remedy, has been largely constructed, but is not currently operational. Existing restrictions are in place to prevent exposure to contaminated groundwater. Biodegradation processes of benzene appear to be occurring within the TI zone, where sampling shows reduced benzene distribution and decreasing concentrations. A hotspot of benzene found east of the TI zone appears to be outside the extraction/reinjection system range, and may not be remediated with the current treatment plant. The extent of the overall plume footprint of chlorobenzene, TCE and pCBSA has remained generally stable since the first comprehensive sampling events in 2004 and 2006. However, there have been several locations within the plume where groundwater samples have had unexplained, rapid increases in concentration in a short-time.

Certain exposure assumptions, toxicity values, and cleanup levels identified in the ROD have since changed. Vapor intrusion, which was not addressed in the ROD, is currently being evaluated. EPA has sampled over 107 residences in the neighborhood above and adjacent to the Montrose and Del Amo Sites, and found a number of data points that exceeded its indoor air screening levels. Based on the information available, it appears that vapor intrusion does not pose an urgent risk.

The contours of the TI Waiver Zone were established on the basis of EPA's conclusion that it would be technically impracticable to achieve MCLs in the presence of high DNAPL concentrations. Consideration was not given to the potential for vapor intrusion from the shallower groundwater units, especially under the neighborhood to the south of the former Del Amo facility.

Cleanup standards have changed for several chemicals: chloroform, ethylbenzene and 1,2,4-trichlorobenzene all have lower MCLs. For each of these contaminants, their respective ISGS is not

within the acceptable cancer risk range of 10^{-6} to 10^{-4}, and therefore, protectiveness may be affected. The remedy did not select an ISGS for Tertiary-Butyl Alcohol (TBA), a contaminant now present at the Dual Site and which also may affect protectiveness.

The ROD identifies California's Anti-Degradation Policy as an applicable requirement for the selected remedy. However, the ROD did not explicitly include an analysis of possible degradation due to injection of pCBSA. An Anti-Degradation Policy analysis should be conducted before the groundwater treatment system starts full operation. There have been a few changes to the location-specific and action-specific ARARs identified in the ROD, none of which affect the protectiveness of the remedy.

In 2015, California's Office of Environmental Health Hazard Assessment (OEHHA) re-evaluated its earlier toxicity assessment for pCBSA using the same toxicity studies available at the time of the 1999 ROD, and arrived at a recommendation for a public health protective concentration of 3,000 µg/L. EPA's Superfund Technical Support Center reviewed OEHHA's reassessment, concluded that OEHHA's reassessment was "not reliable," and determined that there is still insufficient information to determine a screening provisional reference values for pCBSA.

8. Issues

Table 8-1 summarizes the issues identified during the five-year review process for the Dual Site Groundwater Operable Unit of the Montrose Chemical and Del Amo Superfund Sites.

Table 8-1. Issues

Issue	Affects Protectiveness? (Y/N)	
	Current	**Future**
1. The potential for a vapor intrusion pathway in the residential neighborhood south of the Del Amo Site has not been fully assessed.	N	Y
2. The criteria for selecting the Technical Impracticability Zone did not include the potential for vapor intrusion from groundwater.	N	Y
3. The current Dual Site groundwater monitoring network is not sufficient to adequately characterize the full extent of the Dual Site contaminants, including para-chlorobenzene sulfonic acid (pCBSA).	N	Y

Issue	Affects Protectiveness? (Y/N)	
4. A unified Conceptual Site Model (CSM) has not been developed for the Dual Site. The CSMs for the Montrose Chemical and Del Amo Sites differ, and hydrogeologic interpretations developed for other facilities in the area are not consistent with the conceptual hydrogeology at the Dual Site.	N	Y
5. The last production well survey for the Dual Site was conducted in 2003. The ROD requires an updated well survey every five years.	N	Y
6. The Dual Site Groundwater Extraction and Treatment System (GWETS) is not operational and groundwater contamination is not being remediated, with numerous consequences, including: a. the dissolved plume is continuing to migrate into clean or less contaminated water units, and potentially including those used for drinking water; and b. potential exposure risks via the vapor intrusion pathway are not being abated.	N	Y
7. Upgradient groundwater contaminated with chlorinated solvents (mainly TCE) continues to migrate into the dissolved plume and comingle with Dual Site contaminants.	N	Y
8. Groundwater cleanup work overseen by agencies other than EPA at multiple source areas near the Dual Site may interfere with effectiveness of the remedy.	N	Y
9. Under the ROD, intrinsic biodegradation is the remedy for benzene in the UBF and MBFB. The effectiveness of biodegradation cannot be fully evaluated from the data collected to date.	N	Y
10. The ROD selected active extraction/reinjection for dissolved-phase benzene in the area outside the TI zone in the MBFC and Gage. The GWETS, when operational, may not capture all of that benzene.	N	Y
11. The toxicity information and/or MCLs for chloroform, ethylbenzene, and 1,2,4-trichlorobenzene have changed since the ROD was issued.	N	Y
12. The ROD contemplates migration of pCBSA due to reinjection. The ROD or the underlying FS therefore should have included an analysis of that migration, consistent with California's Anti-Degradation Policy.	N	Y

Issue	Affects Protectiveness? (Y/N)	
13. Tertiary-Butyl Alcohol (TBA) has been detected in several wells. The ROD did not include TBA as a contaminant of concern or select an ISGS for TBA, and therefore no remedial component has been designed or implemented to address it.	N	Y
14. Reporting limits for some COCs are greater than the ISGS value, impeding EPA's ability to assess compliance with the ROD.	N	Y
15. The OEHHA reassessment suggests a public health concentration for pCBSA that is lower than the reinjection level selected in the 1999 ROD. EPA's Superfund Technical Support Center determined that there is insufficient information to identify a screening provisional reference value for pCBSA.	N	N[1]

[1]EPA's preliminary modeling of the impact of reinjecting pCBSA at 25,000 µg/L shows that existing drinking water production wells will not be impacted by pCBSA in the next 50 years, which is the maximum timeframe calculated by the model. Based on this information and currently available data, the reinjection standard of 25,000 µg/L will not negatively affect the protectiveness of the remedy. However, EPA acknowledges that based on OEHHA's calculations, the State has cast doubt on the reinjection standard; EPA also acknowledges that its own Superfund Technical Support Center disagrees with OEHHA's methodology. It is important to note that since the issuance of the ROD, there have been no new toxicological studies on pCBSA that might justify a change to the reinjection standard. However, EPA and the State agree that more studies are warranted. In addition, EPA will continue to conduct groundwater monitoring and modeling to track migration of pCBSA throughout the lifetime of the remedy.

9. Recommendations and Follow-up Items

Issues and recommendations identified during the five-year review process for the Dual Site Groundwater Operable Unit are presented in Table 9-1 below.

Table 9-1. Recommendations

Issue	Recommendations / Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date
1. The potential for a vapor intrusion pathway in the residential neighborhood south of the Del Amo Site has not been fully assessed.	Collect soil vapor and possibly additional indoor air samples to further assess the potential for a vapor intrusion pathway. All historical and recent soil vapor and indoor air data should be evaluated.[1]	EPA	EPA	Early 2017
2. The criteria for selecting the Technical Impracticability Zone did not include the potential for vapor intrusion from groundwater.	Complete the vapor intrusion assessment, and consider whether the TI Waiver Zone remains protective in light of any potential vapor intrusion risk.	EPA	EPA	2018
3. The current Dual Site groundwater monitoring network is not sufficient to adequately characterize the full extent of the Dual Site contaminants, including para-chlorobenzene sulfonic acid (pCBSA).	Install additional groundwater monitoring wells to track full extent of all Dual Site contaminants to the non-detect level in all aquifer units. Evaluate the need for sentinel wells to provide additional data on the migration of pCBSA outside the chlorobenzene dissolved plume.	PRPs	EPA	2017
4. A unified Conceptual Site Model (CSM) has not been developed for the Dual Site. The CSMs for the Montrose Chemical and Del Amo Sites differ, and hydrogeologic interpretations developed for other facilities in the area are not consistent with the conceptual hydrogeology at the Dual Site.	The CSM should integrate the differing Montrose and Del Amo conceptual hydrogeologic models, integrate CSMs developed for other facilities, include sources of contamination in the vicinity of the Dual Site, include production pumping, and identify potential receptors and mutual effects of production pumping and remedial activities.	PRPs	EPA	2017
5. The last production well survey for the Dual Site was conducted in 2003. The ROD requires an updated well survey every five years.	Prepare an updated well survey for the Dual Site and include all potential vertical conduits.	PRPs	EPA	2016
6. The Dual Site Groundwater Extraction and Treatment System (GWETS) is not operational and groundwater contamination is not being remediated, with numerous consequences, including: a. the dissolved plume is continuing to migrate into clean or less contaminated	Continue to work toward achieving operational status of the GWETS to contain and remediate the Dual Site COCs.	PRPs EPA DTSC	EPA	2016

Issue	Recommendations / Follow-	Party	Oversight	Milestone
water units, and potentially including those used for drinking water; and b. potential exposure risks via the vapor intrusion pathway are not being abated.				
7. Upgradient groundwater contaminated with chlorinated solvents (mainly TCE) continues to migrate into the dissolved plume and comingle with Dual Site contaminants.	Isolate and hydraulically contain TCE source areas to attain the goals of the ROD. Implement additional data collection and groundwater investigations to better characterize the TCE plume distribution (ROD, page 11-15). As necessary, design and construct groundwater containment system(s) to prevent further migration of TCE as outlined in the performance based approach in the ROD (11-25, 26).	PRPs EPA DTSC	EPA	2018
8. Groundwater cleanup work overseen by agencies other than EPA at multiple source areas near the Dual Site may interfere with effectiveness of the remedy.	A multi-site strategy should be developed to ensure effective coordination with other agencies.	EPA DTSC RWQCB	EPA	2016
9. Under the ROD, intrinsic biodegradation is the remedy for benzene in the UBF and MBFB. The effectiveness of biodegradation cannot be fully evaluated from the data collected to date.	Collect and report additional lines of evidence such as geochemical and physiochemical groundwater quality parameters as part of the Monitoring Aquifer Compliance Plan or other plans to evaluate the effectiveness of intrinsic biodegradation.	PRPs	EPA	2017
10. The ROD selected active extraction/reinjection for dissolved-phase benzene in the area outside the TI zone in the MBFC and Gage. The GWETS, when operational, may not capture all of that benzene.	Determine whether the GWETS will capture the benzene in the MBFC and Gage. If not, design and implement active hydraulic extraction and treatment of benzene.	PRPs	EPA	2017
11. The toxicity information and/or MCLs for chloroform, ethylbenzene, and 1,2,4-trichlorobenzene have changed since the ROD was issued.	Reevaluate the protectiveness of the ROD's groundwater cleanup standards for chloroform, ethylbenzene, and 1,2,4-trichlorobenzene.	EPA	EPA	2017
12. The ROD contemplates migration of pCBSA due to reinjection. The ROD or the underlying FS therefore should have included an	Complete an Anti-Degradation Policy analysis for migration of pCBSA.	EPA	EPA	2016

Issue	Recommendations / Follow-	Party	Oversight	Milestone
analysis of that migration, consistent with California's Anti-Degradation Policy.				
13. Tertiary-Butyl Alcohol (TBA) has been detected in several wells. The ROD did not include TBA as a contaminant of concern or select an ISGS for TBA, and therefore no remedial component has been designed or implemented to address it.	Consider whether protectiveness of the selected remedy requires adoption of a cleanup standard (ISGS) for TBA.	EPA	EPA	2019
14. Reporting limits for some COCs are greater than the ISGS value, impeding EPA's ability to assess compliance with the ROD.	Revise sampling plans to include analysis procedures that can achieve lower reporting limits below the ISGS.	PRPs	EPA	2016

[1] The potential vapor intrusion pathway into structures overlying the former Del Amo facility property is being addressed separately, and is discussed in the concurrently issued Del Amo Five-Year Review.

9.1. Additional Follow-up Actions

The following recommendation does not affect current protectiveness, but should be addressed through follow-up actions:

- This year, applying a new methodology, the State of California derived a new non-promulgated public health concentration of 3,000 µg/L for pCBSA. EPA has determined that there is insufficient toxicological data to modify the reinjection standard. To date, pCBSA has not been detected at municipal supply wells. EPA should continue to conduct groundwater monitoring for pCBSA at municipal supply wells and other wells to confirm pCBSA does not impact drinking water sources. If detectable levels of pCBSA are observed during groundwater monitoring in areas approaching drinking water wells, EPA will notify the State, water purveyors, and other stakeholders.

- The OEHHA reassessment suggests a public health protective concentration for pCBSA that is lower than the reinjection level selected in the 1999 ROD. EPA's Superfund Technical Support Center determined that there is still insufficient information to identify a screening provisional reference value for pCBSA. Regardless, both EPA and the State acknowledge that given the limited toxicological information available, additional studies of pCBSA are warranted. EPA should work with the State to identify the type of studies that would be valuable to risk assessment at the Site and to develop an action plan to see that such studies are conducted.

- EPA should resolve its difference of position with the State regarding the pCBSA re-injection standard in a timely manner.

10. Protectiveness Statement

The groundwater remedies at the Dual Site Groundwater Operable Unit of the Montrose Chemical and Del Amo Superfund Sites are currently protective of human health and the environment. There is no exposure to contaminated groundwater, and the recent preliminary investigation of vapor intrusion did not indicate that vapor intrusion from the Dual Site groundwater is an urgent risk. EPA is continuing its vapor intrusion investigation. Benzene appears to be biodegrading, although more data is needed before a more definitive determination can be made. However, to be protective in the long term, the groundwater extraction and treatment system needs to start full operation; the TI zone needs to be reassessed in the context of a potential vapor intrusion pathway; and the need for an active groundwater extraction and treatment system for benzene needs to be evaluated. The following additional issues need to be addressed to ensure long-term protectiveness: the adequacy of the monitoring well network, the need for additional information about the toxicity of pCBSA, development of a comprehensive area-wide coordination and cleanup strategy, and changes to MCLs and toxicity information.

11. Next Review

As long as waste is left on-site at levels that do not allow for unlimited use and unrestricted exposure, five-year reviews will continue to be statutorily required. The next FYR will be due within five years of the signature date of this FYR.

Appendix A: List of Documents Reviewed

.

[This page is intentionally blank]

List of Documents Reviewed

AECOM, March 2015, “2014 Baseline Monitoring and Aquifer Compliance Report”

AECOM, December 2012, “Remedial Wellfield and Treatment System Performance Evaluation Test Plan”

AECOM, December 2012, “Site Management Plan”

AECOM, July 2014, “Groundwater Monitoring and Aquifer Compliance Plan, Montrose Superfund Site”

AECOM, November 2014, “Draft Operation and Maintenance Manual, Torrance Groundwater Remediation System”

Applied Process Technology, September 2009, “HiPOx Technology Laboratory Test Repport, pCBSA Reduction and Bromate Control for Groundwater Remediation”

CB&I, April 2014, “Draft Final Vapor Intrusion Screening Evaluation, Montrose-Del Amo Dual Site Groundwater Operable Unit 3, Montrose and Del Amo Superfund Sites, Torrance, California”

CH2M Hill, October 2012, “Technical Memorandum: Current Status of Vapor Intrusion Assessment, Montrose and Del Amo Superfund Sites, Torrance, California”

Geosyntec, April 2012, “Revised Basis of Design Report, Dual Site Groundwater Operable Unit, Montrose Chemical and Del Amo Superfund Sites”

Hargis + Associates, Inc, March 2004, “Production Well Survey Report”

Hargis + Associates, Inc, February 2007, “2006 Groundwater Monitoring Results Report”

Hargis + Associates, Inc, April 2009, “Supplemental Groundwater Sampling and Analysis Results”

South Coast Air Quality Management District, October 2014, “Draft Report Multiple Air Toxics Exposure Study in the South Coast Air Basin”

URS, April 2005, “Del Amo Baseline Groundwater Sampling Report”

URS, January 2010, “Final Soil and NAPL Feasibility Study, Del Amo Superfund Site”, Vols I

URS, June 2012, “Groundwater Monitoring Report”

URS, September 2014, “Groundwater Monitoring and Aquifer Compliance Plan”

URS, February 2015, “2014 Baseline Groundwater Monitoring Report”

Tetra Tech, September 2013, “Groundwater Data Evaluation to Support Vapor Intrusion Assessment, Montrose and Del Amo Superfund Sites”

USEPA, May 1998, “Final Remedial Investigation Report for the Montrose Superfund Site”, Vols I & II

USEPA, March 1999, “Record of Decision for Dual Site Groundwater Operable Unit, Montrose Chemical and Del Amo Superfund Sites”

USEPA, November 2014, “Sampling and Analysis Plan, Vapor Intrusion Investigation, Montrose-Del Amo Residential Investigation”

Water Replenishment District of Southern California, January 2015, “Nearby Drinking Water Wells, WRD Wells and Groundwater Extraction/Reinjection Wells, Montrose and Del Amo Superfund Site”

Appendix B: ARARs

.

[This page is intentionally blank]

Requirement and Citation	Document	Description	Effect on Protectiveness	Comments	Amendment Date
DTSC Hazardous Waste Regulations *Water Quality Protection Standard* C.C.R., Title 22, Division 4.5, Chapter 14, Article 6, § 66264.92(a)	1999 ROD	This regulation provides criteria for establishing water quality standards for permitted hazardous waste facilities.	There have been no changes to this regulation. Protectiveness is not affected.	This ARAR is waived within the Technical Impracticability Waiver Zone established in the 1999 ROD, but applies to the other areas of the Dual Site Groundwater Operable Unit.	N/A
DTSC Hazardous Waste Regulations *Constituents of Concern* C.C.R., Title 22, Division 4.5, Chapter 14, Article 6, § 66264.93 and *Concentration Limits* C.C.R., Title 22, Division 4.5, Chapter 14, Article 6, §§ 66264.94(a)(3),(c),(d),(e)(1)	1999 ROD	These regulations provide criteria for specifying constituents of concern and concentration limits for permitted hazardous waste facilities.	There have been no changes to these regulations. Protectiveness is not affected.	These ARARs are waived within the Technical Impracticability Waiver Zone established in the 1999 ROD, but applies to the other areas of the Dual Site Groundwater Operable Unit.	N/A

Requirement and Citation	Document	Description	Effect on Protectiveness	Comments	Amendment Date
DTSC Hazardous Waste Regulations *Monitoring Point and Point of Compliance* C.C.R., Title 22, Division 4.5, Chapter 14, Article 6, § 66264.95(a) (first two sentences only)	1999 ROD	This regulation provides criteria for specifying a point of compliance for permitted hazardous waste facilities.	There have been no changes to this regulation. Protectiveness is not affected.	This ARAR is waived within the Technical Impracticability Waiver Zone established in the 1999 ROD, but applies to the other areas of the Dual Site Groundwater Operable Unit.	N/A
DTSC Hazardous Waste Regulations *General Water Quality Monitoring and System Requirements* C.C.R., Title 22, Division 4.5, Chapter 14, Article 6, § 66264.97(b)(1)(A), (b)(1)(D), (b)(3-7), (d)(2)(A), (d)(2)(D)	1999 ROD	This regulation provides requirements for a water quality monitoring program for permitted hazardous waste facilities.	Changes to this requirement do not affect protectiveness.	Includes a new paragraph that requires all wells be adequately decommissioned if wells are no longer providing useful information. This change does not affect protectiveness.	12 May 2011

Requirement and Citation	Document	Description	Effect on Protectiveness	Comments	Amendment Date
DTSC Hazardous Waste Regulations *Corrective Action Program* C.C.R., Title 22, Division 4.5, Chapter 14, Article 6, § 66264.100(b) (first sentence only), (c)(first sentence), (d)	1999 ROD	This regulation provides corrective action program requirements for permitted hazardous waste facilities.	There have been no changes to this regulation. Protectiveness is not affected.	§ 66264.100(b)(first sentence) and (c)(first and second sentence) are waived within the Technical Impracticability Waiver Zone established in the 1999 ROD, but apply to the other areas of the Dual Site Groundwater Operable Unit. As indicated in the 1999 ROD, EPA guidance will be used for the monitoring program instead of requirements set in §66264.100(d).	N/A

Requirement and Citation	Document	Description	Effect on Protectiveness	Comments	Amendment Date
DTSC Hazardous Waste Regulations *Identification and Listing of Hazardous Waste* C.C.R., Title 22, Division 4.5, Chapter 11 (§ 66261)	1999 ROD	This regulation provides criteria for determining whether a solid or liquid waste is a California hazardous waste.	Changes to this requirement do not affect protectiveness.	Changes include new administrative requirements, universal waste requirements, and treated wood waste requirements. These changes do not affect the protectiveness of the remedy.	11 Jun 1999 6 Mar 2000 6 Jul 2000 11 Nov 2000 18 Nov 2000 5 Jul 2001 3 Aug 2001 3 Nov 2001 12 Apr 2002 13 Feb 2003 15 Mar 2003 7 Jun 2004 1 Jan 2007 30 Apr 2007 1 Jul 2007 4 Feb 2009 23 Jul 2010 15 Oct 2012 15 Sep 2014
DTSC Hazardous Waste Regulations *Hazardous Waste Determination by Generators* C.C.R., Title 22, Division 4.5, Chapter 12, Article 1, § 66262.11	1999 ROD	This regulation provides criteria for generators to determine if a waste is hazardous.	Changes to this requirement do not affect protectiveness.	Changes are related to universal wastes and accumulation exemptions for households and small quantity generators. These changes do not affect protectiveness.	8 Feb 2002 15 Mar 2003

Requirement and Citation	Document	Description	Effect on Protectiveness	Comments	Amendment Date
DTSC Hazardous Waste Regulations *Accumulation Time* C.C.R., Title 22, Division 4.5, Chapter 12, Article 3, § 66262.34	1999 ROD	This regulation sets limits on hazardous waste accumulation by a generator.	Changes to this requirement do not affect protectiveness.	Administrative changes were made. These changes do not affect protectiveness.	3 Aug 2000 11 Sept 2000 13 Jan 2005 24 Aug 2006
DTSC Hazardous Waste Regulations *General Waste Analysis* C.C.R., Title 22, Division 4.5, Chapter 14, Article 2, § 66264.13(a)(1), (b)	1999 ROD	This regulation provides criteria for developing and implementing a waste analysis plan.	There have been no changes to this regulation. Protectiveness is not affected.		N/A
DTSC Hazardous Waste Regulations *Hazardous Waste Facility General Security Requirements* C.C.R., Title 22, Division 4.5, Chapter 14, Article 2, § 66264.14(a), (b)	1999 ROD	This regulation provides requirements for security at a hazardous waste facility.	There have been no changes to this regulation. Protectiveness is not affected.		N/A

Requirement and Citation	Document	Description	Effect on Protectiveness	Comments	Amendment Date
DTSC Hazardous Waste Regulations *General Facility Inspection Requirements* C.C.R., Title 22, Division 4.5, Chapter 14, Article 2, § 66264.15	1999 ROD	This regulation provides requirements for general inspections at a hazardous waste facility.	There have been no changes to this regulation. Protectiveness is not affected.		N/A
DTSC Hazardous Waste Regulations *Hazardous Waste Facility General Requirements for Ignitable Reactive or Incompatible Wastes* C.C.R., Title 22, Division 4.5, Chapter 14, Article 2, § 66264.17	1999 ROD	This regulation provides requirements specific to handling ignitable, reactive, and incompatible wastes.	There have been no changes to this regulation. Protectiveness is not affected.		N/A
DTSC Hazardous Waste Regulations *Location Standards* C.C.R., Title 22, Division 4.5, Chapter 14, Article 2, § 66264.18	1999 ROD	This regulation provides seismic considerations for placement of facilities.	There have been no changes to this regulation. Protectiveness is not affected.		N/A

Requirement and Citation	Document	Description	Effect on Protectiveness	Comments	Amendment Date
DTSC Hazardous Waste Regulations *Hazardous Waste Facility Seismic and Precipitation Standards* C.C.R., Title 22, Division 4.5, Chapter 14, Article 2, § 66264.25	1999 ROD	This regulation provides design requirements for protection against natural rainfall and seismic events.	There have been no changes to this regulation. Protectiveness is not affected.		N/A
DTSC Hazardous Waste Regulations *Design and Operation of Facility* C.C.R., Title 22, Division 4.5, Chapter 14, Article 3, § 66264.31	1999 ROD	This regulation provides general emergency preparedness requirements.	There have been no changes to this regulation. Protectiveness is not affected.		N/A
DTSC Hazardous Waste Regulations *Required Equipment* C.C.R., Title 22, Division 4.5, Chapter 14, Article 3, § 66264.32	1999 ROD	This regulation provides emergency preparedness equipment requirements.	There have been no changes to this regulation. Protectiveness is not affected.		N/A

Requirement and Citation	Document	Description	Effect on Protectiveness	Comments	Amendment Date
DTSC Hazardous Waste Regulations *Testing and Maintenance* C.C.R., Title 22, Division 4.5, Chapter 14, Article 3, § 66264.33	1999 ROD	This regulation requires regular maintenance and testing of emergency preparedness equipment.	There have been no changes to this regulation. Protectiveness is not affected.		N/A
DTSC Hazardous Waste Regulations *Access to Communications or Alarm System* C.C.R., Title 22, Division 4.5, Chapter 14, Article 3, § 66264.34	1999 ROD	This regulation provides emergency communication requirements.	There have been no changes to this regulation. Protectiveness is not affected.		N/A
DTSC Hazardous Waste Regulations *Required Aisle Space* C.C.R., Title 22, Division 4.5, Chapter 14, Article 3, § 66264.35	1999 ROD	This regulation provides requirements to allow emergency responder access.	There have been no changes to this regulation. Protectiveness is not affected.		N/A

Requirement and Citation	Document	Description	Effect on Protectiveness	Comments	Amendment Date
DTSC Hazardous Waste Regulations *Arrangements With Local Authorities* C.C.R., Title 22, Division 4.5, Chapter 14, Article 3, § 66264.37	1999 ROD	This regulation provides criteria for emergency preparedness arrangements with local emergency responders.	There have been no changes to this regulation. Protectiveness is not affected.		N/A
DTSC Hazardous Waste Regulations *Purpose and Implementation of Contingency Plan* C.C.R., Title 22, Division 4.5, Chapter 14, Article 4, § 66264.51	1999 ROD	This regulation requires facility to have and implement a contingency plan.	There have been no changes to this regulation. Protectiveness is not affected.		N/A
DTSC Hazardous Waste Regulations *Content of Contingency Plan* C.C.R., Title 22, Division 4.5, Chapter 14, Article 4, § 66264.52	1999 ROD	This regulation provides criteria for a contingency plan.	There have been no changes to this regulation. Protectiveness is not affected.		N/A

Requirement and Citation	Document	Description	Effect on Protectiveness	Comments	Amendment Date
DTSC Hazardous Waste Regulations *Copies of Contingency Plan* C.C.R., Title 22, Division 4.5, Chapter 14, Article 4, § 66264.53(a)	1999 ROD	This regulation specifies to whom copies of the contingency plan are provided.	There have been no changes to this regulation. Protectiveness is not affected.		N/A
DTSC Hazardous Waste Regulations *Amendment of Contingency Plan* C.C.R., Title 22, Division 4.5, Chapter 14, Article 4, § 66264.54	1999 ROD	This regulation specifies when a contingency plan must be amended.	There have been no changes to this regulation. Protectiveness is not affected.		N/A
DTSC Hazardous Waste Regulations *Emergency Coordinator* C.C.R., Title 22, Division 4.5, Chapter 14, Article 4, § 66264.55.	1999 ROD	This regulation requires an emergency coordinator be designated.	There have been no changes to this regulation. Protectiveness is not affected.		N/A
DTSC Hazardous Waste Regulations *Emergency Procedures* C.C.R., Title 22, Division 4.5, Chapter 14, Article 4, § 66264.56	1999 ROD	This regulation specifies procedures to be taken in the event of an emergency.	There have been no changes to this regulation. Protectiveness is not affected.		N/A

Requirement and Citation	Document	Description	Effect on Protectiveness	Comments	Amendment Date
DTSC Hazardous Waste Regulations *Closure Performance Standard* C.C.R., Title 22, Division 4.5, Chapter 14, Article 7, § 66264.111	1999 ROD	This regulation specifies facility closure requirements.	There have been no changes to this regulation. Protectiveness is not affected.		N/A
DTSC Hazardous Waste Regulations *Closure Plan* C.C.R., Title 22, Division 4.5, Chapter 14, Article 7, § 66264.112 (a)(1), (b)	1999 ROD	This regulation specifies requirements for a written closure plan.	There have been no changes to this regulation. Protectiveness is not affected.		N/A
DTSC Hazardous Waste Regulations *Disposal and Decontamination of Equipment, Structures and Soils* C.C.R., Title 22, Division 4.5, Chapter 14, Article 7, § 66264.114	1999 ROD	This regulation specifies requirements during a facility closure.	There have been no changes to this regulation. Protectiveness is not affected.		N/A

Requirement and Citation	Document	Description	Effect on Protectiveness	Comments	Amendment Date
DTSC Hazardous Waste Regulations *Post-Closure Care and Use of Property* C.C.R., Title 22, Division 4.5, Chapter 14, Article 7, § 66264.117(a),(b)(1) and (d)	1999 ROD	This regulation specifics post-closure requirements for facilities at which hazardous waste will not be removed during closure.	There have been no changes to this regulation. Protectiveness is not affected.		N/A
DTSC Hazardous Waste Regulations *Post-Closure Notices* C.C.R., Title 22, Division 4.5, Chapter 14, Article 7, § 66264.119(a) (regarding notice to the local zoning authority) and (b)(1)	1999 ROD	This regulation specifies notices to be given following facility closure.	There have been no changes to this regulation. Protectiveness is not affected.		N/A
DTSC Hazardous Waste Regulations *Use and Management of Containers* C.C.R., Title 22, Division 4.5, Chapter 14, Article 9, §§ 66264.171-178	1999 ROD	These regulations specify the requirements for storing hazardous waste containers.	There have been no changes to this regulation. Protectiveness is not affected.		N/A

Requirement and Citation	Document	Description	Effect on Protectiveness	Comments	Amendment Date
DTSC Hazardous Waste Regulations *Design and Installation of New Tank System or Components* C.C.R., Title 22, Division 4.5, Chapter 14, Article 10, § 66264.192	1999 ROD	This regulation provides requirements for new tank systems.	There have been no changes to this regulation. Protectiveness is not affected.		N/A
DTSC Hazardous Waste Regulations *Containment and Detection of Releases* C.C.R., Title 22, Division 4.5, Chapter 14, Article 10, § 66264.193(b),(c), (d), (e) and (f)	1999 ROD	This regulation provides requirements for secondary containment of tank systems.	There have been no changes to this regulation. Protectiveness is not affected.		N/A
DTSC Hazardous Waste Regulations *General Operating Requirements* C.C.R., Title 22, Division 4.5, Chapter 14, Article 10, § 66264.194	1999 ROD	This regulation provides general requirements for tank system operation.	There have been no changes to this regulation. Protectiveness is not affected.		N/A

Requirement and Citation	Document	Description	Effect on Protectiveness	Comments	Amendment Date
DTSC Hazardous Waste Regulations *Inspections* C.C.R., Title 22, Division 4.5, Chapter 14, Article 10, § 66264.195	1999 ROD	This regulation specifies requirements for inspections of tank systems.	There have been no changes to this regulation. Protectiveness is not affected.		N/A
DTSC Hazardous Waste Regulations *Response to Leaks or Spills and Disposition of Leaking Or Unfit-for Use Tank Systems* C.C.R., Title 22, Division 4.5, Chapter 14, Article 10, § 66264.196	1999 ROD	This regulation specifies procedures in the event of a tank system spill.	There have been no changes to this regulation. Protectiveness is not affected.		N/A
DTSC Hazardous Waste Regulations *Closure and Post Closure Care* C.C.R., Title 22, Division 4.5, Chapter 14, Article 10, § 66264.197	1999 ROD	This regulation specifies requirements for tank system closure.	There have been no changes to this regulation. Protectiveness is not affected.		N/A

Requirement and Citation	Document	Description	Effect on Protectiveness	Comments	Amendment Date
DTSC Hazardous Waste Regulations *Standards: Pumps in Light Liquid Service* C.C.R., Title 22, Division 4.5, Chapter 14, Article 28, § 66264.1052	1999 ROD	This regulation specifies general air quality requirements for pumps in light liquid service.	There have been no changes to this regulation. Protectiveness is not affected.		N/A
DTSC Hazardous Waste Regulations *Standards: Compressors* C.C.R., Title 22, Division 4.5, Chapter 14, Article 28, § 66264.1053	1999 ROD	This regulation specifies general air quality requirements for compressors.	There have been no changes to this regulation. Protectiveness is not affected.		N/A
DTSC Hazardous Waste Regulations *Standards: Valves in Gas/Vapor Service or Light Liquid Service* C.C.R., Title 22, Division 4.5, Chapter 14, Article 28, § 66264.1057	1999 ROD	This regulation specifies general air quality requirements for valves in gas/vapor service or light liquid service.	There have been no changes to this regulation. Protectiveness is not affected.		N/A

Requirement and Citation	Document	Description	Effect on Protectiveness	Comments	Amendment Date
DTSC Hazardous Waste Regulations *Standards: Pumps and Valves in Heavy Liquid Service, Pressure Relief Devices in Light Liquid or Heavy Liquid Service, and Flanges and Other Connectors* C.C.R., Title 22, Division 4.5, Chapter 14, Article 28, § 66264.1058	1999 ROD	This regulation specifies general air quality requirements for pumps and valves in heavy liquid service, pressure relief devices in light liquid or heavy liquid service, and flanges and other connectors	Changes to this requirement do not affect protectiveness.	Administrative changes were made. These changes do not affect protectiveness.	11 Jun 1999

Requirement and Citation	Document	Description	Effect on Protectiveness	Comments	Amendment Date
DTSC Hazardous Waste Regulations *Alternate Standards for Valves in Gas/Vapor Service or in Light Liquid Service: Percentage of Valves Allowed to Leak* C.C.R., Title 22, Division 4.5, Chapter 14, Article 28, § 66264.1061 and *Alternate Standards for Valves in Gas/Vapor Service or in Light Liquid Service: Skip Period Leak Detection and Repair* C.C.R., Title 22, Division 4.5, Chapter 14, Article 28, § 66264.1062	1999 ROD	This regulation specifies requirements to allow alternative valve standards.	Changes to this requirement do not affect protectiveness.	Administrative changes were made. These changes do not affect protectiveness.	§66264.1061: N/A §66264.1062: 11 Jun 1999
DTSC Hazardous Waste Regulations *Test Methods and Procedures* C.C.R., Title 22, Division 4.5, Chapter 14, Article 28, § 66264.1063	1999 ROD	This regulation specifies test method requirements for air quality testing.	There have been no changes to this regulation. Protectiveness is not affected.		N/A

Requirement and Citation	Document	Description	Effect on Protectiveness	Comments	Amendment Date
DTSC Hazardous Waste Regulations *Design and Operating Standards* C.C.R., Title 22, Division 4.5, Chapter 14, Article 29, § 66264.1101	1999 ROD	This regulation specifies requirements for design and operation of containment buildings.	There have been no changes to this regulation. Protectiveness is not affected.		N/A
DTSC Hazardous Waste Regulations *Closure and Post Closure Care* C.C.R., Title 22, Division 4.5, Chapter 14, Article 29, § 66264.1102	1999 ROD	This regulation specifies requirements for closure of containment buildings.	There have been no changes to this regulation. Protectiveness is not affected.		N/A
DTSC Hazardous Waste Regulations *Hazardous Waste Dilution Prohibition as a Substitute for Treatment* C.C.R., Title 22, Division 4.5, Chapter 18, Article 1, § 66268.3	1999 ROD	This regulation specifies prohibitions relating to substitutions to adequate treatment, including dilution and combustion.	Changes to this requirement do not affect protectiveness.	Administrative changes were made. These changes do not affect protectiveness.	4 Jun 1999

Requirement and Citation	Document	Description	Effect on Protectiveness	Comments	Amendment Date
SCAQMD Rules and Regulations *New Source Review* Regulation XIII	1999 ROD	These regulations set requirements for new, modified, or relocated facilities with air emissions.	Changes to this requirement are unlikely to affect protectiveness.	Administrative changes were made. These changes do not affect protectiveness.	Rule 1302: 20 Oct 2000 6 Dec 2002 Rule 1303: 20 Oct 2000 16 Feb 2001 20 Apr 2001 6 Dec 2002 Rule 1304.1: 6 Sept 2013 Rule 1306: 20 Oct 2000 6 Dec 2002 Rule 1309: 6 Dec 2002 5 Feb 2010 5 Jul 2013 Rule 1309.1: 20 Apr 2001 9 Nov 2001 3 May 2002 8 Sept 2006 8 Jan 2010

Requirement and Citation	Document	Description	Effect on Protectiveness	Comments	Amendment Date
(cont'd) SCAQMD Rules and Regulations *New Source Review* Regulation XIII					Rule 1315: 8 Sept 2006 3 Aug 2007 8 Jan 2010 4 Feb 2011 Rule 1316: 2 Dec 2005 Rule 1325: 3 Jun 2011 5 Dec 2014
SCAQMD Rules and Regulations *Prohibitions - Visible Emissions* Regulation IV, Rule 401	1999 ROD	This rule prohibits visible air emissions.	Changes to this requirement do not affect protectiveness.	Administrative changes were made. These changes do not affect protectiveness.	9 Nov 2001
SCAQMD Rules and Regulations *Nuisance* Regulation IV, Rule 402	1999 ROD	This rule prohibits emission of nuisance air contaminants.	There have been no changes to this regulation. Protectiveness is not affected.		N/A
SCAQMD Rules and Regulations *Prohibitions - Fugitive Dust* Regulation IV, Rule 403	1999 ROD	This rule prohibits anthropogenic emission of fugitive dust.	Changes to this requirement do not affect protectiveness.	Administrative changes were made. These changes do not affect protectiveness.	2 Apr 2004 3 Jun 2005

Requirement and Citation	Document	Description	Effect on Protectiveness	Comments	Amendment Date
SCAQMD Rules and Regulations *Disposal of Solid and Liquid Wastes* Regulation IV, Rule 473	1999 ROD	This rule lists prohibitions related to incinerator use.	There have been no changes to this regulation. Protectiveness is not affected.		N/A
SCAQMD Rules and Regulations *National Emission Standards for Hazardous Air Pollutants* Regulation X	1999 ROD	This regulation incorporates national emission standards into the local regulations.	Changes to this requirement are unlikely to affect protectiveness.	As indicated in the 1999 ROD, this regulation is only applicable to benzene. Administrative changes were made. These changes do not affect protectiveness.	13 Aug 1999 11 May 2001 7 May 2004 2 Dec 2005 4 Apr 2008
SCAQMD Rules and Regulations *New Source Review of Air Contaminants* Regulation XIV, Rule 1401	1999 ROD	This rule sets limits on allowable risk for air emission permits.	Changes to this regulation may affect protectiveness.	Administrative changes were made. These changes do not affect protectiveness.	12 Mar 1999 13 Aug 1999 17 Mar 2000 18 Aug 2000 15 June 2001 3 May 2002 7 Feb 2003 2 May 2003 4 Mar 2005 7 Mar 2008 5 June 2009 10 Sept 2010

Requirement and Citation	Document	Description	Effect on Protectiveness	Comments	Amendment Date
Federal Maximum Contaminant Levels *National Primary Drinking Water Regulations: Maximum Contaminant Levels and Maximum Residual Disinfectant Levels* 40 C.F.R. §§ 141.60 – 141.66	1999 ROD	These regulations set chemical concentration limits for drinking water for the nation.	Changes to these regulations may affect protectiveness.	MCLs for bromoform, chloroform, and dichlorobromomethane were removed and are now regulated as Total THMs. These ARARs are waived within the Technical Impracticability Waiver Zone established in the 1999 ROD, but apply to the other areas of the Dual Site Groundwater Operable Unit.	7 Dec 2000 16 Jan 2001 22 Jan 2001 25 Mar 2003 29 Jun 2004 4 Jan 2006 13 Feb 2013

Requirement and Citation	Document	Description	Effect on Protectiveness	Comments	Amendment Date
State Maximum Contaminant Levels *Maximum Contaminant Levels – Inorganic Chemicals* C.C.R., Title 22, Division 4, Chapter 15, Article 4, § 64431 and *Maximum Contaminant Levels – Organic Chemicals* C.C.R., Title 22, Division 4, Chapter 15, Article 5.5, § 64444		These regulations set chemical concentration limits for drinking water for the state of California.	Changes to these regulations may affect protectiveness.	MCLs for bromoform, chloroform, and dichlorobromomethane were removed and are now regulated as Total THMs. Lowered MCLs for ethylbenzene and 1,2,4-trichlorobenzene became effective on June 12, 2003. These ARARs are waived within the Technical Impracticability Waiver Zone established in the 1999 ROD, but apply to the other areas of the Dual Site Groundwater Operable Unit.	§64431: 13 May 2003 19 Sept 2007 29 Oct 2009 7 Jul 2014 § 64444: 17 May 2000 13 May 2003
SWRCB Resolution *Statement of Policy with Respect to Maintaining High Quality Waters in California* SWRCB Resolution 68-16	1999 ROD	This resolution dictates rules for maintaining high quality water in California.	There have been no changes to this regulation. Protectiveness is not affected.	This ARAR is applicable to the reinjection of groundwater as part of the remedial action.	N/A

Requirement and Citation	Document	Description	Effect on Protectiveness	Comments	Amendment Date
SWRCB Regulation *General Water Quality Monitoring and System Requirements.* C.C.R., Title 22, Division 3, Chapter 15, Article 5, § 2550.7(b)(5)	1999 ROD	This regulation specifies requirements for groundwater monitoring.	There have been no changes to this regulation. Protectiveness is not affected.		N/A
SCAQMD Guidelines *South Coast Air Quality Management District, Best Available Control Technology Guidelines Document*	1999 ROD	This document provides guidance for implementing air quality control technologies.	Changes to this guidance are unlikely to affect protectiveness.	Changes to these guidelines were made to reflect changes in the SCAQMD New Source Review regulations. These changes do not affect protectiveness.	6 Jun 2003 5 Dec 2003 9 Jul 2004 14 Jul 2006

Appendix C: Interviews

[This page is intentionally blank]

Five-Year Review Interview Record			
Site:	Dual Site Groundwater Operable Unit- Montrose and Del Amo Superfund Sites	**EPA ID No:**	CAD008242711, CAD029544731

Interview Type: *Visit*

Location of Visit: Montrose Treatment Plant building, Los Angeles, CA

Date: June 19th, 2015

Time: 10:30 AM

Interviewers

Name	Title	Organization
Aaron King	Environmental Engineer	USACE
Marlowe Laubach	Chemical Engineer	USACE

Interviewees

Name	Organization	Title	Telephone	Email
Michael Palmer	de Maximis	Project Coordinator	(619) 546-8377	mpalmer@demaximis.com

Summary of Conversation

1) What is your overall impression of the project?
Construction of the treatment plant was completed in December 2014. Functional testing and equipment shakedowns are in progress, but the plant has not been turned on yet. De Maximis is looking forward to starting up the plant and entering the O&M phase.

2) Is the remedy functioning as expected? How well is the remedy performing?
The system is currently undergoing functional testing and equipment shakedowns; the remedy has not yet been turned on.

3) What does the monitoring data show? Are there any trends that show contaminant levels are decreasing?
The system has not been turned on yet. There was one baseline monitoring event in November 2014. Another comprehensive baseline monitoring event, where the whole well field will be sampled, will be conducted in September 2015.

4) Is there a continuous O&M presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities.
Once the plant is running, there will not be a continuous O&M presence. The system will be operated remotely. Daily inspections will occur on weekdays.

5) Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines in the last five years? If so, do they affect protectiveness of the remedy? Please describe changes and impacts.
No. The system has not been turned on yet, so O&M has not started.

6) What are the annual operating costs for your organization's involvement with the site?
O&M has not started yet, so annual operating costs are not available.

7) Have there been unexpected O&M difficulties or costs at the site in the last five years? If so, please give details.
The system was built in the last five years, but O&M has not yet started.

8) Have there been opportunities to optimize O&M or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.
It is too early to tell. Assessing opportunities for optimization will be part of future activities.

9) Are you aware of any changes in Federal/State/County/Local laws and regulations that may impact the protectiveness of the remedy?
No.

10) Do you have any comments, suggestions, or recommendations regarding the project?
De Maximis is looking forward to completing the functional testing and equipment shakedowns, and to starting to pump water.

Community Involvement

Del Amo and Montrose Superfund Sites Groundwater OU, Torrance, CA

Introduction

The U.S. Environmental Protection Agency (EPA) coordinated a large community outreach event on June 19 – 20, 2015 in the nearby community. A week prior to the event, EPA had mailed postcards to residences in the community to inform them of the event. EPA established a mobile information center (MIC) at 1100 on June 19 at the corner of W. 204t St. and Budlong Ave to allow for community members to learn about the site, ask questions, and be interviewed for the Five-Year Review (FYR) if desired. U.S. Army Corps of Engineers (USACE) personnel were present to perform interviews for inclusion to the FYR. Additionally, EPA staff went door to door in the community to invite residents to visit the MIC and provide input to the FYR or get other information about the site. During the canvassing effort, EPA staff provided comment cards (a blank example can be found at the end of this appendix) and fact sheets (also at the end of this appendix) to allow residents a convenient way to provide input to the FYR. Completed comment cards could be dropped off at the MIC or mailed to EPA's San Francisco office.

During the two-day effort, EPA staff knocked on over 500 doors, and more 25 people visited the MIC to talk with EPA staff. EPA staff was able to have crucial conversations with key leaders of the Del Amo Action Committee (DAAC), a local community organization focused on these sites and others in the area. Additionally, EPA staff was able to speak with 14 residents regarding the results of the recent vapor intrusion investigation. During the event, USACE interviewed four key community members and received three completed comment cards. An additional comment card was received following the field event.

Following the outreach event, DAAC e-mailed EPA and USACE a list of community members that DAAC would like for USACE to interview for the FYR. Of the 15 community members on the list, eight had already been interviewed (4 people), provided a comment card (1 person), spoke to EPA staff during door-to-door visits (1 person), visited the MIC (1 person), or e-mailed a request for comment (1 person; no response). Additionally, DAAC identified several community partners that they would like to be interviewed for the FYR.

On July 8th, 2015, USACE e-mailed requests for comments to several community partners, including California Communities Against Toxics (CCAT), Clean Air Matters (CAM), Berkeley University, the Water Replenishment District of Southern California (WRDSC), and the California Department of Toxics Control (DTSC). CCAT, CAM, and WRDSC replied. Members of CCAT and CAM were interviewed via telephone on July 10th and July 13th, respectively. WRDSC provided written responses to the request for comment on July 17th. DTSC provided written responses to the request for comment on July 30th.

Between July 16th and July 20th, USACE reached out via telephone or e-mail to four of the seven community members left on DAAC's list, but received no responses. Between July 2 and July 9, 2015, EPA conducted additional field visits to speak with the other three community members, and sent a follow-up e-mail to one of those with no response.

A record of all of the community input is provided below.

Del Amo Action Committee

In-person interview at the MIC on June 19th, 2015

DAAC Member 1 had several significant concerns:

1. It is unclear if the Montrose treatment system was designed to address contamination from the ILM and Boeing plumes in the nearby area that are part of a larger commingled plume. She was concerned that either the treatment system won't be effective for those plumes, or that those plumes would impinge on the ability of the treatment system to treat the Montrose/Del Amo groundwater.
2. She stated that the lack of agreement in place to maintain the treatment system is a serious problem.
3. pCBSA was given an unacceptably high standard in the ROD. EPA tests have shown that the treatment system will not decrease pCBSA concentrations even to the ROD level. Adequate treatment should be provided in the treatment train.
4. She was concerned that more extraction wells would be needed to control migration. Groundwater has moved past the point where the model said it would. What happens if 700 gpm cannot be achieved?
5. She suggested that EPA should investigate other options for positive reuse. For example, as drinking water, industrial water, or aquifer recharge.
6. The TI waiver zone is a problem because it won't be cleaned up in the residents' lifetimes; people feel powerless.
7. The sites in the area are not being looked at holistically and coherently, but rather in a piecemeal fashion.

Del Amo Action Committee

In-person interview at the MIC on June 19th, 2015

DAAC member 2 felt that the site is "orphaned." With such a long-lasting site, people come and go; there is no consistency with the people involved. There's a lack of stewardship. People who move to the area are not aware of the site issues and that's a problem. It's also difficult to get people to understand when they don't have any background. The public website and repository are a hodgepodge of various information and are not incredibly helpful, but the public needs access to the data to make their own judgments and EPA needs to find more creative ways to help people understand the issues. OU1 isn't being addressed and that's concerning. The TI Waiver zone is confusing and it should be revisited. People are living on top of it, so new remedies should be looked at. There needs to be a holistic description of how all of the OUs fit together and the community needs to know the plan.

Del Amo Action Committee

In-person interview at the MIC on June 19th, 2015

DAAC member 3 answered the questions on the comment card in list form:

1. Generally, the Site has been mismanaged. There has been a large gap between the ROD and the completion of the RS, which is a failure. The treatment plant is incapable of treating pCBSA to protective levels. pCBSA has been found at levels higher than originally thought, and changes to the pCBSA standard could cause changes to the treatment system. Montrose thinks they can reinject waster with 25 ppm when the DTSC level is 3 ppm; DAAC is trying to keep them from turning on the system for this reason. Don't believe that doing anything is doing something. Regarding the TI Waiver, cost is being put before the community; people shouldn't be living on top of contamination like that given the long remediation timeframes of the proposed remedies; we don't know where EPA will be in the future. The community has been kept in limbo a long time regarding vapor intrusion. Vapors are coming off the groundwater and are coming from industry in the region. It has been a hard fight to assure that people are being protected. Also, there are too many OUs with different managers, etc. Things are complicated and can't possibly come together to form a holistic solution, though EPA has stated that it would. It's confusing how the remedy for OU3 is going to make everything better; we shouldn't pretend that the other OUs don't exist or aren't priorities. The waste pits remedy is very concerning; worried that it will continue to contaminate groundwater. Other available technologies should be looked at. Members of the community have had severe health problems, and she wonders if they are related to the Sites. EPA presents information in a fragmented manner, which gives people the feeling that they're not being protected. The community has not been getting straight answers about vapor intrusion or the park, and they're exhausted; it's confusing to put in a park in a community that may need to be relocated.
2. For the waste pits, the location of the carbon regeneration is important. It's not good enough to incinerate it. The community is now more in tune with what is going on at the sites, and the sites need a real evaluation, not more sacrifices. Installation of the groundwater treatment system was a nightmare. It was a year of noise and stress. Trying to get information was difficult. Contractors were initially not monitoring for VOCs as required, and subsequent sampling was biased. It was very traumatic for the community.
3. The treatment could be more robust if the community wasn't here. The presence of the contamination is dangerous to the community, and relocation should be considered. Additionally, there needs to be a comprehensive strategy for the Sites.
4. The waste pits caught on fire when it was being capped. Also, someone stole electrical equipment from the waste pits when construction was occurring.
5. Yes, because she has demanded to be well-informed. People have had to be demanding to keep informed. Some at EPA are better at informing the community than others.

Resident 1

In-person interview at the MIC on June 19th, 2015

Resident 1 answered the questions on the comment card in list form:

1. Resident 1 indicated that, though EPA is courteous and communication has improved, the communication has generally been slow, inconsistent, and sometimes misleading, especially regarding the vapor intrusion results. People in the area had issues during the treatment plant construction and there is graffiti all over, but fences around the site are mended quickly. He stated that the OU3 remedy is a joke; to spend $22 million on a water treatment plant that doesn't work… EPA should be working to fix the pCBSA issue, and should take a conservative position to protect the community. The TI Waiver just keeps getting renewed; no one is being held accountable for it. Resident 1 was not informed about the site before moving in, and suggests that there needs to be something to inform people prior to moving in or buying a property; even signage near the treatment plant would help. Lots of houses are in the

TI waiver zone, but there is no deed restriction. Based on the data, vapor intrusion appears to be occurring in his house; will air filtration be provided? This is of utmost importance because he wants to have a family and is concerned about contamination affecting the health of potential children. There is a need for testing and retesting for vapor intrusion since contamination remains. There needs to be an objective look to make sure that proper vapor intrusion testing procedures are being followed.

2. Resident 1 noted that the road replaced as a result of extraction system piping construction is loud and is torn up; the quality of the road is poor. He indicated that the treatment system should not be turned on before it can be effective, and that EPA could be more expedient in coming up with the best solution for the community. The fact that there is no accountability for the TI Waiver zone has been demoralizing and is demeaning to the community.
3. See questions 1 and 2.
4. The area has high gang activity; graffiti occurs often and fences get cut (though are quickly mended). Waste in the area is picked up quickly.
5. Because of the community involvement, EPA puts on a good face, but there are some honesty and consistency issues. EPA is not very timely with their information either. Resident 1 is grateful for the information he does receive, but has to validate the information he receives.

Resident 2

Comment card provided during outreach event

Resident 2 wants to be contacted regarding any concerns about construction of the park or with any questions about the area in general. He would also like to receive information about events and buildings in the park.

Resident 3

Comment card provided during outreach event

Resident 3 indicated that she hadn't received any information about the site except in the week prior. She is worried about the cleanup and the health of her grandchildren. She noted that she hadn't noticed any change in the water, and that she hadn't observed any vandalism in the neighborhood.

Resident 4

Comment card provided during outreach event

Resident 4 answered the questions on the comment card in list form:

1. The remedy for the Waste Pits (OU2) was made in 1997, 18 years ago, and according to two Five-Year Reviews is functioning according to plan. However, in 18 years, new problems that affect groundwater contamination and residents, such as vapor intrusion, DNAPL, and pCBSA have emerged that were not considered in the original OU2 remedy. The frightening part for residents is how these toxins may be interacting. Generally, they are moving in a southeast direction under homes.
2. The responsible parties (RPs) are protected by the TI Waiver, which should be examined rigorously because it lets the RPs off lightly.
3. Land-use restrictions should be evaluated for the residential area in unincorporated LA County, as well as for the Waste Pits area in the LA City area.

4. The increasing number of contaminants and movement in the southeast direction under homes has a negative effect on the psyche of the community. Parents are very concerned about their children growing up in the area, especially woman who are pregnant. As a result, home values have dropped, owners are not informing prospective tenants, and low income people don't have the resources to move.
5. Politicians responsible for the area need to be informed of the Five-Year Review so they can give input on issues, such as the deed restrictions for occupancy and future development.

Resident 5

Comment card provided following outreach event

Resident 5 was concerned that the fence around the waste pits site was penetrable; that people walk their dogs, ride bikes, and operate ATVs on the site. Resident 5 also wants to receive an e-mail or phone call because she has questions regarding her health status as it relates to the site, and the health status of her children.

California Communities Against Toxics

Telephone interview on July 10th, 2015

Regarding the Dual Groundwater Plume, CCAT member 1 laid out several of the biggest problems. First, the commingled groundwater plume contains pCBSA, which has a cleanup level in the ROD that is too high. Since the plan is to reinject water, a toxicological profile and/or other studies should be completed to assess the effects of reinjection. Comments along these lines were provided to EPA, but EPA was not responsive. Furthermore, the remedy does not even meet the specifications of the ROD regarding pCBSA removal, and then new action levels have been set. The remedy will have to be retrofitted because it has been shown that it isn't going to work. CCAT member 1 indicated that a stakeholder process should be put in place to collaborate and move forward to get to a revised remedy. Without EPA working with the community on the ground, public health issues and construction of remedies that won't be successful will continue. Furthermore, CCAT member 1 noted that the groundwater is still expanding, and would like to see interception of the toe of the plume.

Regarding the DNAPL, CCAT member 1 indicated that as EPA was trying to move towards a remedy, EPA received comments that not all available technologies were evaluated. Electrical resistance heating (ERH) was chosen. However, the remedy selection needs to be informed by the soil vapor intrusion investigation; COCs were detected in almost every house tested, so the remedy should be reconsidered in light of the vapor intrusion data. Existing conditions are not protective of human health. CCAT member 1 reiterated that the issue could have been avoided if only EPA had listened and been responsive.

Regarding the stormwater lateral, CCAT member 1 indicated that people are relying on the LA RWQCB to ensure that there is not residual contamination in stormwater runoff. This was a significant problem in the past, but she is uncertain if it still is. Was the response action at the waste pits adequate for addressing this?

Regarding the shallow soils and soil gas on the Montrose site, CCAT member 1 noted that soil characterizations indicated that it is not protective of human health and the environment, that people

would still be exposed because it hasn't been remediated, and that redeveloping for residential land use is inappropriate. She was disappointed in EPA's response that it was ok to put a school on a site that has not been remediated (though the school was not built).

Generally, CCAT member 1 wants to get EPA to be a real partner, to act in a collaborative way with all stakeholders to move the project further, saying that it's in everyone's best interest.

Clean ir Matters

Telephone interview on July 13th, 2015

The following questions were asked:

1. What are your overall impressions, comments, or suggestions about the management and operation of the site?
2. What effects have operations at the waste pits and construction of the groundwater system had on the surrounding community?
3. Are you aware of any community concerns regarding the Site? Any regarding operations at the waste pits? Any regarding the newly built groundwater system? If so, please give details.
4. Are you aware of any events, incidents, or activities at the waste pits or groundwater treatment plant such as vandalism, trespassing, or emergency responses from local authorities? If so, please give details.
5. Do you feel well-informed about the Del Amo Superfund Site's activities and progress?
6. Do you have any relevant information that may aid in our review?

CAM member 1 replied as follows:

1. Broadly, it's a mess. The Sites have been in the cleanup process for decades. She is troubled that not much work has gone forward for many portions of the site where exposure pathways exist. Specifically, OU1 and OU2 have plans in place that have not gone forward; the timeline is concerning. The slow progress at OU 3 and its remedial timeline are problematic, and further segmenting OU3 is a concern. There has not been adequate or consistent involvement with the community. There is not a stable information repository in the community, and EPA presence is not consistent or stable, which leads to confusion on behalf of the community and delays in the project.
2. There is concern about the groundwater extraction and treatment system being adequate for the task, with the decision to leave NAPL in place forever. The decision to reinject groundwater containing pCBSA outside the existing groundwater plume is concerning; short-term expediency appears to have prioritized over long-term impact. Additionally, contractor failure to monitor VOCs during construction prior to Cynthia contacting EPA may be representative of how a lot of things have happened, and brings up broader questions about oversight; it might be indicative of more systemic issues. Furthermore, the way the construction of the groundwater treatment plant was set up prevented some customers from entering businesses. EPA responded that there was nothing that they could do about it. Understanding the needs of the local businesses and communities is important in taking actions. This speaks to a broader inability to manage community expectations, impacts, and experiences around actions that EPA is responsible for; it seems like EPA does not care.
3. In addition to the pCBSA and whether the newly built treatment system is adequate to the task, the timeframe of the remedy is problematic. Because of the decision to leave DNAPL in

place, ultimately the goal is to prevent it from spreading; based on review of the FS, the groundwater system will need to operate 3,100 to 4,800 years. The community was understandably concerned about the timeline, but EPA didn't understand why the community was concerned. There is always going to be a groundwater plume under residences with highly volatile compounds, there is currently evidence of vapors in some homes but EPA is still figuring out where the vapors are coming from, and there is always the possibility that there could be vapor intrusion in the future. The community is always at risk for vapor intrusion since the remediation timeframe is so long, and there needs to be a robust system that monitors vapor intrusion until cleanup is complete. Additionally, there hasn't been adequate consideration of new pathways developing via earthquakes.

4. No.
5. CAM member 1 knows more than most about the Site, but does not feel well-informed by EPA.
    a. There really needs to be a complete information repository available inside the community. The current repository is too far from the community, and that creates a barrier to engagement. Given that community involvement is important, having the document on a CD isn't the same as having a printed document, document summaries, or people to ask questions to.
    b. Breaking down the site into so many pieces (OUs) makes it difficult for the community to completely understand. Who can keep up? Competent community involvement is paramount.
    c. EPA's handling of the Sites has made it difficult for the community to remain engaged. There are different RPMs for each OU, which makes it difficult for each community member to be adequately involved. Furthermore, EPA shows up in ways that are hard to interact with.
6. CAM member 1 suggested that comments from the Technical Assistance Services for Communities (TASC) technical assistance providers regarding vapor intrusion, the Groundwater Assessment and Remediation Plans, and the Montrose DNAPL Feasibility Study might be helpful for the review or could help frame the history of EPA's interactions with stakeholders and the community. She also noted that some white powder DDT during some trenching during construction, which leads to the question whether or not the characterization is complete. Finally, she hoped that USACE would think seriously about breaking the site into all the current pieces as it pertains to cleanup and impacts to the community, how the timeframes for the remedy are not plausible, how several OUs still don't have completed Feasibility Studies, and how the characterization might not be complete yet.

Water Replenishment District of Southern California

Provided written comments on July 17th, 2015

WRDSC member 1comments are provided unaltered below.

WATER REPLENISHMENT DISTRICT
OF SOUTHERN CALIFORNIA

DIRECTORS
[redacted], PRESIDENT
[redacted] VICE PRESIDENT
[redacted], SECRETARY
[redacted], TREASURER
[redacted], DIRECTOR

[redacted]., GENERAL MANAGER

July 17, 2015

Transmitted via e-mail to: Aaron.S.King@usace.army.mil

Mr. Aaron King, EIT
Environmental Engineer, Technical Services Branch
United States Army Corps of Engineers, Seattle District
PO Box 3755
Seattle, WA 98124-3755

RE: WRD Responses to the 5-Year Review Questions Regarding the Del Amo Superfund Site (OU1 and OU2) and the Dual Site Groundwater (OU3) associated with the Del Amo and Montrose Chemical Superfund Sites, Los Angeles, California

Dear Mr. King,

As the largest groundwater agency in the State of California, the Water Replenishment District of Southern California (WRD) replenishes, manages, and protects two of the most utilized urban groundwater basins in the nation, the West Coast Basin and Central Basin. Our 420-square mile service area includes approximately 4 million residents in southern Los Angeles County and encompasses 43 cities, including a portion of the City of Los Angeles. Approximately 240,000 acre-feet (78 billion gallons) of groundwater are pumped annually from these basins. As you know, both the Del Amo and Montrose Chemical Superfund Sites are located in the West Coast Basin. As a result, WRD has a strong interest in ensuring that cleanup of these sites is not only protective of human health, but also preserves the long-term quality of the groundwater resources our agency is charged with managing.

WRD appreciates the opportunity to comment on the six 5-Year Review questions regarding the Del Amo and Montrose Chemical Superfund Sites provided by the United States Army Corps of Engineers (USACE) on July 8, 2015. The USACE has set a due date for responses by no later than July 17, 2015. WRD feels that six business days to comment on these important questions is not sufficient for the preparation of in-depth technical responses and may prevent other stakeholders from commenting. Further, based on our review of the questions, we believe that the United States Environmental Protection Agency (EPA) and USACE did not fully incorporate the various technical concerns raised at previous Site-related meetings.

Below are WRD's responses to the 5-Year Review questions provided by USACE regarding the Del Amo and Montrose Chemical Superfund Sites.

1. What are your overall impressions, comments or suggestions about the management and operation of the Site?

According to the *June 2015 Fact Sheet* issued by the EPA for the 5-Year Review for the Del Amo Superfund Site, the purpose of the 5-Year Review is to evaluate if the cleanup remedies are protective of human health and the environment. In order to meet this goal, EPA stated that they would like to answer the following three key questions:

- Is the remedy functioning as intended by the decision documents?
- Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy selection still valid?
- Has other information come to light that could call into question the protectiveness of the remedy?

WRD is concerned that none of these critical questions posed by the EPA were addressed by any of the 5-Year Review questions provided by USACE on July 8th. Thus, WRD feels that the subject review ultimately may be inadequate. We recommend that a supplemental set of technical-based questions be incorporated as part the 5-Year Review and that no determination regarding the status of the Sites be made prior to the USACE/EPA review of the responses to the supplemental questions. Due to the inadequacy of the initial USACE questions, WRD recommends at least one public meeting be held to gather stakeholder comments before the 5-Year Review is expected to be completed in October 2015. We understand this may delay the completion of the 5-Year Review, but feel it is necessary.

In addition, WRD has the following recommendations:

- Immediately improve communication with key stakeholders via more frequent technical updates and more transparency regarding the remediation design and implementation details,
- Implement semi-annual meetings between the key regulatory agencies, WRD, and Del Amo Action Committee, and
- Commit to timely transmittal of site-related data and documents (e.g. *Draft Monitoring and Aquifer Compliance Plan*, as-built drawings of the treatment system, groundwater modeling data, etc.) for review and comment by WRD.

2. What effects have operations at the waste pits and construction of the groundwater system had on the surrounding community?

Continued delays in implementing any reasonable remediation activities at the Sites pose an existential threat to the quality of groundwater resources within the West Coast Basin. As a public agency entrusted with protecting and preserving groundwater resources in the West Coast Basin, WRD believes remediation of the soil and groundwater at the Sites is vital and should be expedited, especially since it has been confirmed that contaminants, including chlorobenzene, have been detected as deep as the Lynwood Aquifer beneath the Site. WRD is very concerned

about the volume/mass of contamination beneath the Sites. At the November 22, 2011, technical meeting between the EPA, California Department of Toxic Substances Control (DTSC), Los Angeles Regional Water Quality Control Board (RWQCB), and WRD, the DTSC stated that it was critical to implement mass removal in the Technical Impracticability (TI) Waiver Zone. WRD strongly agrees with DTSC's stance regarding mass removal, and also recommends that intensive groundwater monitoring by the responsible party should resume as soon as possible.

In the *Draft Feasibility Study* for the cleanup of dense non-aqueous phase liquid (DNAPL) at the Montrose Chemical Superfund Site, Montrose Chemical and their consultant proposed remedial alternatives that would require more than three millennia (3,000 years) to achieve groundwater cleanup goals. Economic concerns aside, WRD believes any proposal for a 3,000 year timeline for groundwater cleanup is entirely unacceptable. Experience at many contaminated sites has shown that the best approaches for remediation often contain a combination of remedial technologies and that within these suites of technologies, some may be multi-phased in order to more quickly neutralize all identified chemicals of concern. Simple mass reduction via excavation or large diameter augers are two such approaches.

3. Are you aware of any community concerns regarding the Site? Any regarding operations at the waste pits? Any regarding the newly build groundwater system? If so, please give details.

WRD, as a key stakeholder in the community, is highly concerned that the EPA has not reopened the *Record of Decision* (ROD) to incorporate the Public Health Protective Concentration of 3 parts per million (ppm) for para-chlorobenzensulfonic acid (pCBSA) issued by the California Office of Environmental Health Hazard Assessment (OEHHA) in March 2015. Further, waters of the State beneath the Site, including the Upper Bellflower Aquitard (UBA), Middle Bellflower Sand (BFS), Lower Bellflower Aquitard (LBA), Gage Aquifer, and Lynwood Aquifer, are designated for beneficial use, and therefore must be protected. WRD strongly opposes the discharge of inadequately treated water or water containing remediation byproducts into the subsurface that could further degrade the water quality of these aquifers.

With regards to reinjection of treated water, WRD strongly recommends that the EPA and RWQCB adopt limits of "nondetect" for anthropogenic chemicals of concern where no scientific or regulatory criteria currently exist, which is in accordance with the *State Antidegradation Policy* (Resolution No. 68-16 adopted by the State Water Resources Control Board on October 28, 1968). The *State Antidegradation Policy* was established to maintain aquifers with the "highest water quality consistent with the maximum benefit to the people of the State" and protect the designated beneficial uses. All reinjection activities should comply with State Waste Discharge Requirements.

Additionally, WRD believes that the advancement in remedial technologies and engineering experience since 1999 when the original ROD was certified warrants another close evaluation of the TI Waiver Zone. The presence of contaminated groundwater beyond the previously mapped

boundaries of the TI Waiver Zone clearly demonstrates that there has been transport of contamination that was not anticipated by EPA in 1999. Thus, the ROD should be reopened and the validity of the existing TI Waiver Zone be tested against current Site data. By doing so, this will fully serve the stipulated purpose of the 5-Year Review process as described in the *June 2015 Fact Sheet*.

4. Are you aware of any events, incidents, or activities at the waste pits or groundwater treatment plant such as vandalism, trespassing, or emergency responses from local authorities? If so, please give details.

This seems to be a generic question and not specifically related to the status of the Sites. While WRD has not been made aware of any incidents, such vandalism, trespassing, or emergency responses, at the waste pits or groundwater treatment plant, WRD cannot understand the importance of this question in determining the effectiveness of the cleanup remedies.

5. Do you feel well informed about the Del Amo Superfund Site's activities and progress?

No, please see response to Question 1 above.

6. Does your Agency have any technical information that may aid in our review?

Yes, WRD has tremendous experience and valuable insight that is directly relatable to the investigation, remedial design, and expedited cleanup of the Sites. WRD is the designated groundwater monitoring entity for the Central Basin and West Coast Basin under the State of California's CASGEM program (California Statewide Groundwater Elevation Monitoring). More recently, we have installed regional nested monitoring wells to support regulatory agencies in their investigation of major contaminated sites in the Central Basin. In addition, WRD manages and maintains a network of 324 nested groundwater monitoring wells at 58 locations throughout the Central Basin and West Coast Basin to depths up to 3,000 feet. The wells are measured for water levels every 6 hours using data loggers and sampled semi-annually for numerous constituents, including general minerals, volatile organic compounds, metals, general physical properties, and chemicals of emerging concern. The information generated by the regional monitoring wells is stored in WRD's Geographic Information System (GIS) and provides the basis to evaluate dynamic changes in the basins and the in-house capability to collect, analyze, and report groundwater data. An annual Regional Groundwater Monitoring Report is published by WRD, highlighting the groundwater conditions in the basins based on the monitoring activities performed over the previous year. In addition, WRD has hands-on engineering experience in the design and construction of wellhead treatment systems and treatment plants. As result we can provide technical information and insight, including aquifer specific water quality data, current and historic groundwater level data, regional hydrogeologic conditions, water cleanup technologies, and groundwater production data.

Thank you for your consideration of our comments. If you have any questions, please contact the undersigned at 562-921-5521. We look forward to continue working with the EPA, State regulatory agencies, and Del Amo Action Committee to expedite remediation at the Del Amo and Montrose Chemical Superfund Sites.

Sincerely,

[redacted]

[redacted]

California Department of Toxic Substances Control

Provided written responses on July 31st, 2015

DTSC responses are provided unaltered below.

Del Amo Site OU-1/OU-2 and Montrose/Del Amo Dual Site Groundwater OU-3G
Five-Year Review by U.S. EPA and U.S. Army Corps of Engineers
Comments by the California Department of Toxic Substances Control (DTSC)
July 31, 2015

1) What are your overall impressions, comments or suggestions about the management and operation of the Site?

Overall, the United States Environmental Protection Agency (U.S. EPA) faces considerable challenges managing the ten complex operable units that comprise the Del Amo and Montrose Superfund Sites to achieve timely completion of all remedial activities. While remediation is complete or in progress at some operable units, progress needs to improve, as indicated further below.

Due to the fact that Operable Unit (OU)-1 and OU-2 has one U.S. EPA remedial project manager (RPM), and OU-3G has two RPMs, DTSC's impression is that in instances U.S. EPA lacked a coordinated approach in communicating with DTSC. To ensure effective staff level coordination in the future, DTSC requests U.S. EPA RPMs assigned to the ten operable units at the Del Amo and Montrose Superfund Sites hold regular coordination calls with their DTSC counterparts. In addition to ad hoc discussions to resolve periodic policy level issues, DTSC requests that U.S. EPA management hold semi-annual coordination meetings with their DTSC counterparts to review progress at these operable units and identify policy and technical issues requiring resolution by project managers, technical staff and upper level managers.

OU1/OU2

The timely implementation of the remedy specified in the Del Amo OU-1 Record of Decision (ROD) is a high priority for DTSC. The ROD was signed in 2011 and requires construction of an in-situ chemical oxidation treatment system to reduce the contaminant mass in groundwater beneath the Del Amo site. The ROD requires restrictive land use covenants to be signed with 26 property owners within the Del Amo site boundaries to protect workers and business occupants from hazardous substances. Shell Oil Company ("Shell") is responsible for implementing this remedy and for negotiating the land use covenants on behalf of the state and U.S.EPA. Since the ROD was signed, U.S. EPA, the United States Department of Justice, the California Attorney General's Office, and Shell have been negotiating a consent decree to implement the remedy. It is important that the negotiations be brought to a timely conclusion so that the in-situ treatment remedy can be constructed and land use covenants executed to protect human health and drinking water aquifers. DTSC acknowledges that U.S. EPA is continuing to work diligently with Shell to resolve remaining issues and to get the consent decree completed.

OU-3G

The amount of time it has taken to implement the remedy for the OU-3G ROD is of concern to DTSC. The ROD was signed in 1999 and construction of the groundwater treatment system was not completed until December 2014. The start-up of the system awaits completion of functional tests. Early tests indicate that the system is encountering challenges to meeting the ROD's operation and treatment standards. The state is concerned that the treatment standard of 25 parts per million (ppm) for para-chlorobenzene sulfonic acid ("pCBSA") may not be protective of human health. The California Office of Environmental Health Hazard Assessment ("OEHHA") evaluated the health effects of this substance and in March 2015 issued the document "Public Health Protective Concentration for para-Chlorobenzene Sulfonic Acid." OEHHA identified a public health concentration of three (3) milligrams per liter (mg/L or ppm) for pCBSA in drinking water, which is almost ten times lower than the 25 ppm treatment standard required in the 1999 ROD. DTSC acknowledges that more studies are required to understand the effects of this substance on humans and the environment. Also, a Monitoring and Aquifer Compliance Plan (MACP) has not been finalized for the treatment system. The MACP will specify the methods and protocols to monitor the long term operational performance of the treatment system.

Further delays in implementing the OU-3G remedy will make it costlier and more difficult to achieve the ROD's protectiveness goals. It is important that the system begin operations in a timely manner, employ standards that reflect the latest science, and have effective protocols to monitor the system throughout its operational performance.

2) What effects have operations at the waste pits and construction of the groundwater system had on the surrounding community?

OU1/OU2

DTSC is not aware of any adverse effects on the surrounding community caused by operation of the Del Amo waste pits (OU-1/OU-2) remedy. The Soil Vapor Extraction/In-Situ Bioventing system is operating in accordance with the ROD. The newly installed extraction system is operating, and data indicates the plume is stable. DTSC has not observed any immediate adverse effects from the waste pits on the surrounding community.

OU-3G

OU-3G's groundwater treatment system was completed in December 2014. Currently, the start-up and commissioning of the groundwater treatment system is delayed due to problems with the equipment and components (See Response No. 1 above.). Due to the fact Montrose Chemical Corporation of California ("Montrose") is currently unable to successfully start the system, the groundwater contaminant plumes consisting of benzene, monochlorobenze ("MCB"), pCBSA, and trichloroethylene ("TCE"), continue to spread into and under the surrounding community, down-gradient of the Montrose and Del Amo Superfund sites.

3) Are you aware of any community concerns regarding the Site? Any regarding operations at the waste pits? Any regarding the newly build groundwater system? If so, please give details.

DTSC is aware of community concerns raised by the Del Amo Action Committee (DAAC). The community near OU-1/OU-2 and OU-3G has concerns about the construction and operation of the groundwater treatment system at OU-3G. Among other things, the community believes that Montrose should not have taken a decade to construct the groundwater treatment system, the system does not appear to meet its design criteria, and it may not operate properly due to faulty equipment and components. The community is concerned that the groundwater contaminant plume of MCB, TCE, and benzene will continue to spread into and under its neighborhood as long as the groundwater treatment system remains inoperative and/or does not meet specifications. The community also believes that the treatment standard specified in the ROD for pCBSA is likely not protective of human health and that the current design of the groundwater treatment system does not sufficiently remediate this substance.

On May 4, 2015, U.S.EPA conducted a Five -Year Review meeting for the Del Amo Superfund Site's (OU1/OU2) and the Montrose/Del Amo Dual Site Groundwater unit (OU-3G) to seek input from DAAC. Based on U.S.EPA notes from this meeting, the community expressed the following concerns:

a) How are disagreements on the draft Five-Year Review between Army Corps of Engineers (ACE) and U.S. EPA handled, is the Five-Year review process a public process, and how is it documented?

b) Why was ACE determined to be the sole source contractor for preparing the Draft Five-Year Review report and why was another entity not considered to do the evaluation?

c) How will institutional controls for OU1/OU2 be implemented?

d) How are renters and home buyers informed about the Superfund sites?

e) What is U.S. EPA's role versus the state, city, county?

f) Are there deed restrictions for residential properties (particularly homes over the groundwater plume)?

g) U.S. EPA is not sharing the monthly monitoring reports from Shell with the community.

h) The community was not allowed to participate when decisions on Non-Aqueous Phase Liquid ("NAPL") were made.

i) How will U.S.EPA revisit the remedy in general and during the Five-Year Review and how will U.S.EPA determine whether the remedy is efficient?

j) Has pCBSA impacted drinking water and will the groundwater treatment system treat pCBSA- impacted groundwater, prior to re-injecting the treated groundwater into the Gage aquifer?

k) If a component of the remedy is not implemented, how will the Five-Year Review evaluate it?

l) Is the International Light Metals site a new source of contamination since development of the ROD ?

m) Will U.S.EPA revisit the decision to leave waste in place forever?

n) Will U.S.EPA revisit assumptions in groundwater modeling that are now known to be wrong?

o) Will the Five-Year Review address inadequate groundwater monitoring?

p) Will U.S.EPA allow community representatives to speak with ACE to voice concerns and ask questions?

q) Is vapor intrusion occurring in homes via the groundwater pathway?

r) Is vapor intrusion occurring in homes via the vadose zone pathway?

4) Are you aware of any events, incidents, or activities at the waste pits or groundwater treatment plant such as vandalism, trespassing, or emergency responses from local authorities? If so, please give details.

DTSC is not aware of any events, incidents, or activities (such as vandalism, trespassing, or emergency responses from local authorities) at OU1/OU2 and OU3-G.

5) Do you feel well informed about the Del Amo Superfund Site's activities and progress?

DTSC believes it is more informed than in the recent past. DTSC appreciates U.S. EPA's outreach to state regulatory agencies, stakeholders, and the community for input into this Five-Year Review. This endeavor builds upon the outreach effort U.S. EPA began when the OU-3G groundwater treatment system was completed in December 2014. It is important that U.S. EPA continue to communicate and coordinate with state agencies and stakeholders to ensure their concerns are brought forth and considered in U. S. EPA's actions. As lead state agency for National Priorities List sites, DTSC must be provided with adequate time to review technical and decisional documents and sufficient notice of meetings and conference calls requested by U.S. EPA. Also, U.S. EPA should respond to DTSC's comments and concerns raised in meetings and correspondence. Finally, when requesting DTSC's input, U.S. EPA should provide DTSC with sufficient time to consult with sister agencies, including the Los Angeles Regional Water Quality Control Board, public entities, and community and stakeholder groups with an interest in the Del Amo and Montrose sites.

6) Does your Agency have any technical information that may aid in our review?

DTSC provides its technical information, opinions, and expertise about OU1/OU2 and OU-3G to U.S.EPA on an ongoing basis. Regarding OU1/OU2, DTSC's most current technical information/comments are as follows:

Shell has only relied on Monitored Natural Attenuation (MNA) to remediate benzene contamination in groundwater. However, there is excessive Light Non-Aqueous Phase Liquid ("LNAPL") at several distinct locations at the Del Amo Superfund Site. The dissolved benzene mass remains in the technical impracticability ("TI") zone and will require remediation to prevent the contamination from spreading outside the TI waiver zone. U.S.EPA should require Shell to address how the benzene mass will be reduced at both the source and groundwater plume areas.

Regarding OU-3G, DTSC's most recent technical information/comments are as follows:

a) Shell proposed intrinsic biodegradation (under natural conditions) as a remedy, to treat the benzene plume at OU1/OU2, therefore it pertains to OU-3G. However, DTSC is not aware of any data supporting MNA. More MNA data is needed (i.e. dissolved oxygen, nitrate, sulfate, methane, ORP etc.) including biodegradation organism counts to demonstrate that biological activity inside the dissolved benzene plume is occurring. Additionally, based on 2006 groundwater data, it appears that vertical benzene migration to the Gage aquifer is occurring (up to 500 ug/l at well SWL0063, as listed in the link of http://delamoactioncommittee.org/DEL_OU1_AR_2010/2178781.pdf). Consequently, MNA may not stop the downward migration to underlying aquifers.

b) OU-3G does not have a well-developed and comprehensive Conceptual Area Model that identifies other groundwater contaminant plumes in the area, including which parties are responsible for which plumes, and how the various groundwater systems interact with each other. DTSC views such a model as integral to successful remediation at the OU-3G Site.

c) The current groundwater model developed by Montrose and approved by U.S.EPA predicts a 35% reduction of the MCB plume (outside TI waiver zone/Gage Aquifer) in five years and 100% reduction of the MCB plume in 50 years (after initial start-up of the groundwater treatment system). In order for DTSC to concur with this prediction of plume reduction, MACP data must be provided to support the prediction. Currently, without MACP data, DTSC can only consider the results to be speculative. At this time, the model's prediction may only be used as a reference point pending for verification from field data. Past simulation results at the Del Amo Site failed to indicate that benzene contamination will migrate to Gage aquifer at concentrations up to 500 ug/l.

d) The current groundwater model does not appear to have been adequately calibrated to show other contaminant plumes in the general area, or the interaction of groundwater treatment systems (i.e. at the Exxon Mobile Refinery; or the former Boeing site). The current groundwater model should be recalibrated with 1) the most recent contaminant concentration data, 2) the actual extraction well locations, including the anticipated pumping rates for each

well, and 3) possibly the two new drinking water wells installed by the City of Torrance (upgradient from the proposed groundwater extraction capture zone).

e) The MACP for OU-3G is not complete. The integration of the Del Amo MACP into Montrose's MACP for OU-3G into a joint document has not occurred. Once those MACPs are combined, U.S. EPA and DTSC will still need to evaluate groundwater data gaps for OU/1, OU/2 and OU-3G.

f) DTSC is concerned that there are many contaminated sites near OU-3G, and releases from those sites may influence the groundwater to be treated by, and the operation of, the OU-3G treatment system. The nearby sites include the Jones Chemical site and other sites in the proximity of OU-3G where approximately 60 businesses have operated. DTSC acknowledges that the Jones Chemical site is an operable unit under U.S. EPA's purview. DTSC recommends that U.S. EPA collect data about these sites, provide it to interested parties, and include the data in U.S. EPA's groundwater model. U.S. EPA should require Jones Chemical to investigate and address its groundwater contaminant plume, because the OU-3G and Jones Chemical plumes are co-mingled, and the Jones Chemical plume is contributing to the spreading of the OU-3G plume.

g) Montrose should clarify the effects of Dense Non-Aqueous Phase Liquid ("DNAPL") source removal vs. groundwater treatment of the MCB plume at OU-3G. Montrose should clearly demonstrate how it intends to ensure that no significant DNAPL or dissolved mass will migrate from the TI containment zone, and impact the groundwater treatment system. U.S. EPA should specify what actions Montrose must take if the DNAPL mass spreads outside of the containment zone at OU-3G. U.S. EPA should require Montrose to develop a contingency plan that addresses such potential migration.

h) Injection wells may push or displace the existing plumes at the OU-3G Site to unanticipated areas. U.S. EPA should require Montrose to study the injection trajectory, to ensure that the plumes at each hydrostratigraphic unit within the OU-3G Site will not displace or spread further. Additionally, several injection wells have been relocated around OU-3G due to access agreement issues with property owners. Montrose should confirm that its existing groundwater model reflects the relocated injection wells.

i) At OU-3G, U.S. EPA should require Montrose to confirm whether the DNAPL source mass can be removed. If Montrose cannot confirm this, then U.S. EPA should require Montrose to provide designs that address DNAPL and groundwater remediation in such a way that the mass will be contained and/or removed. The current groundwater model prepared by Montrose and approved by U.S. EPA assumes the DNAPL mass at source zone will not spread away from the containment zone. U.S. EPA should require Montrose to demonstrate that this assumption is accurate. If it is not, then U.S. EPA should require Montrose take whatever actions are necessary, including revising the projected initial and boundary, so that a reliable model is produced.

j) Currently, U.S.EPA is finalizing the Proposed DNAPL Cleanup Plan to address DNAPL residing in soil and groundwater beneath OU-3D. U.S. EPA selected Electrical Resistance Heating (ERH) treatment for a focused area at OU-3D. ERH consists of installing electrodes

throughout the treatment zone and transmitting an electric current between them to heat the soil by electrical resistance. The ERH process would remove chlorobenzene from the DNAPL by vaporizing it. The vapors generated by this process would then be recovered by SVE wells for above-ground vapor treatment. DNAPL source removal contemplated in U.S.EPA's proposed plan assumes the DNAPL mass only exists in the B-Sand and not in deeper zones. This assumption is not supported by C-sand dissolved groundwater data and must be subject to field verification. If the DNAPL mass exists in the deeper parts of the C-zone or below, it will introduce additional contaminant mass to groundwater that the current model prediction will not capture. This additional mass could migrate beyond the TI containment zone and have to be treated by the OU-3G groundwater treatment system.

k) Based on start-up testing data and information, the pCBSA influent concentrations exceed ROD design parameters and therefore Montrose has proposed changing the pumping scheme. In addition, the anti-degredation analysis based on the State Water Board's Anti-Degradation Policy may restrict or influence the proposed injection of pCBSA. If the antidegradation analysis results in modifications to the injection concentrations, then U.S. EPA should reevaluate any changes to injection parameters.

[This page is intentionally blank]

Appendix D: Site Inspection Documents

[This page is intentionally blank]

Trip Report

1. INTRODUCTION

a. Date of Visit: 19 June 2015 – 20 June 2015

b. Location: Torrance, California

c. Purpose: A site visit was conducted to visually inspect and document the conditions of the remedy, the site, and the surrounding area for inclusion into the Five-Year Review (FYR) Report.

d. Participants:

Marlowe Laubach	USACE Seattle, Chemical Engineer
Aaron King	USACE Seattle, Environmental Engineer
Yarissa Martinez	EPA, RPM
Ray Chavira	EPA, RPM
Mike Palmer	De Maximus, Montrose Liaison
Mark Riley	AECOM, PM
Jacob Barnes	Group Delta, Technical Consultant

2. SUMMARY

A site inspection was conducted on the groundwater treatment system which is one component of the remedy for the Dual Site Groundwater operable unit. The system construction was completed by November 30, 2014. The system is currently in shakedown/startup mode (the process where unit operations are first tested to determine whether they are functioning individually, and then testing of the system as a whole to determine whether the system is functioning as designed.) The plant unit operations were inspected and one extraction well was viewed as part of the site inspection. Photos are included at the end of this trip report. Mr. Palmer was then interviewed regarding operations, maintenance, and other activities associated with the groundwater treatment system.

Additionally, a large community outreach event was held following the site visit on June 19, 2015. Community outreach was also performed on June 20, 2015. Details of the community outreach event and community/stakeholder comments are provided in Appendix C of the FYR Report.

3. DISCUSSION

At 0900, the participants met at the Dual Sites Groundwater OU treatment plant located on the Montrose property. The main control building was used to conduct introductions and provide an overview of the treatment system, view the system controls, and the electrical panels. After the overview, the participants headed to the plant pad to inspect each unit operation from the influent tank through the effluent tank and air discharge stack. The system was not actively treating groundwater because the system was in shakedown/start up mode. However, the controls were in operation, monitoring flows, temperature, pressures, and water levels (in the case of the extraction wells.)

The following is a description of the treatment processes. The extracted water will be collected into an influent tank and then filtered using bag filters. The first major unit operation is the HiPOx reactor and its associated ozone generator. The HiPOx reactor is intended to treat the contaminant, pCBSA. The water will then go to air strippers. Sequestrant and defoamer will be introduced to prevent fouling and foaming in the air strippers. There are three plate air strippers which will be operated in series with two strippers in operation at all times. The contaminated air from the strippers will then be dried through a duct heater and sent to vapor granular activated carbon (VGAC) vessels where volatile organic compounds (VOCs) will adsorb. There are 4 VGAC vessels to be operated in series. Three VGAC will be in operation at all times with the fourth held in reserve. The treated air will be sent through a stack with a continuous sampler, which will measure total VOCs. Treated water from the air strippers will be sent to the liquid granular activated carbon (LGAC) vessels. There are 2 LGAC vessels to be run in series. Effluent will be sampled before being re-injected. The effluent will then be sent to 7 injection wells; 3 to the west of the treatment area and 4 to the east of the treatment area.

The tanks, pumps, HiPOX reactor, air strippers, and granular activated carbon vessels were in new condition. In addition, security measures were observed to include fencing and security cameras. The participants also viewed extraction well, EW5, which was located on the Montrose property. It appeared in new condition. Mr. Barnes indicated that all the extraction wells look similar; differences being in the size of the pump depending on the pumping requirements. After the walkthrough, an interview was conducted with Mr. Palmer (the interview record is provided in Appendix C of the FYR Report). The site visit ended about 1100.

Following the site visit, USACE personnel joined EPA staff in conducting an outreach event in the community. Details of the community outreach are provided in Appendix C of the FYR Report.

4. ACTIONS

The USACE will incorporate information obtained from the site visit into the FYR report.

Marlowe Laubach
Chemical Engineer
CENWS-EN-TS-ET

Aaron King
Environmental Engineer
CENWS-EN-TS-ET

[This page is intentionally blank]

Photographs from Site Inspection Visit

Photo 1. Control Building

Photo 2. Control Panels

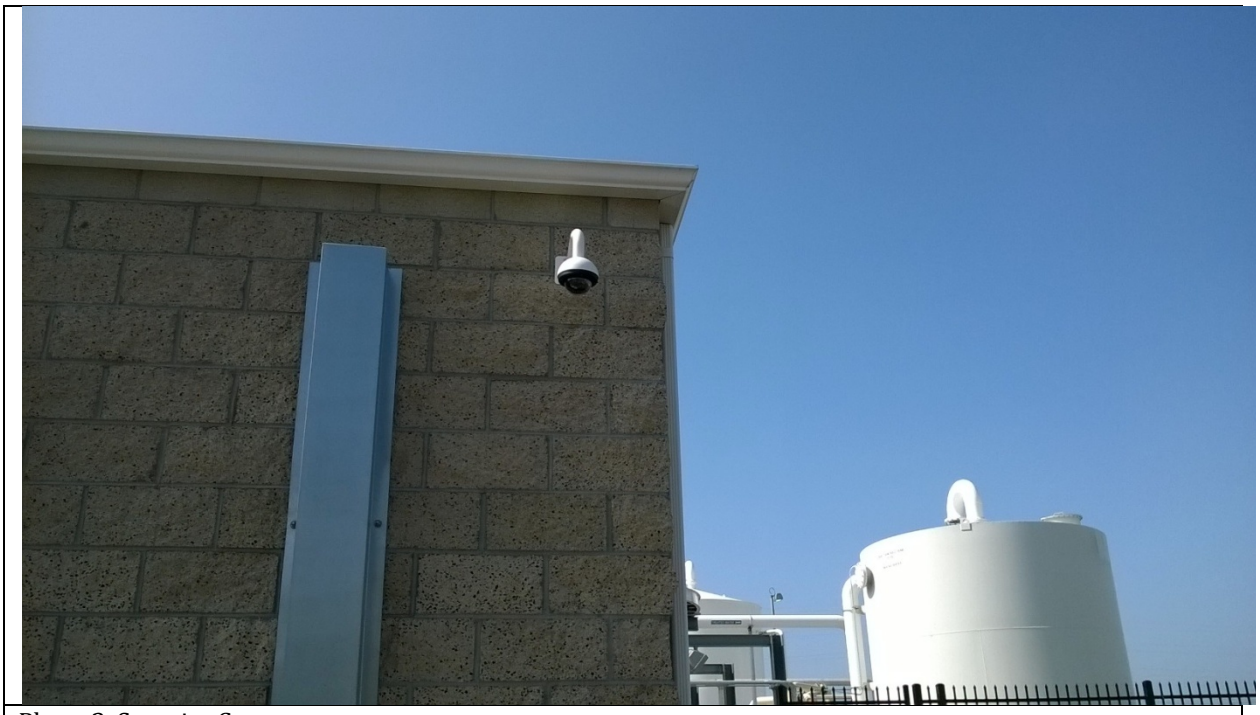

Photo 3. Security Camera

Photo 4. Influent tank

Photo 5. Influent pumps

Photo 6. Bag filters prior to HiPOX reactor

Photo 7. Hydrogen peroxide and the ozone generator for HiPOX Reactor

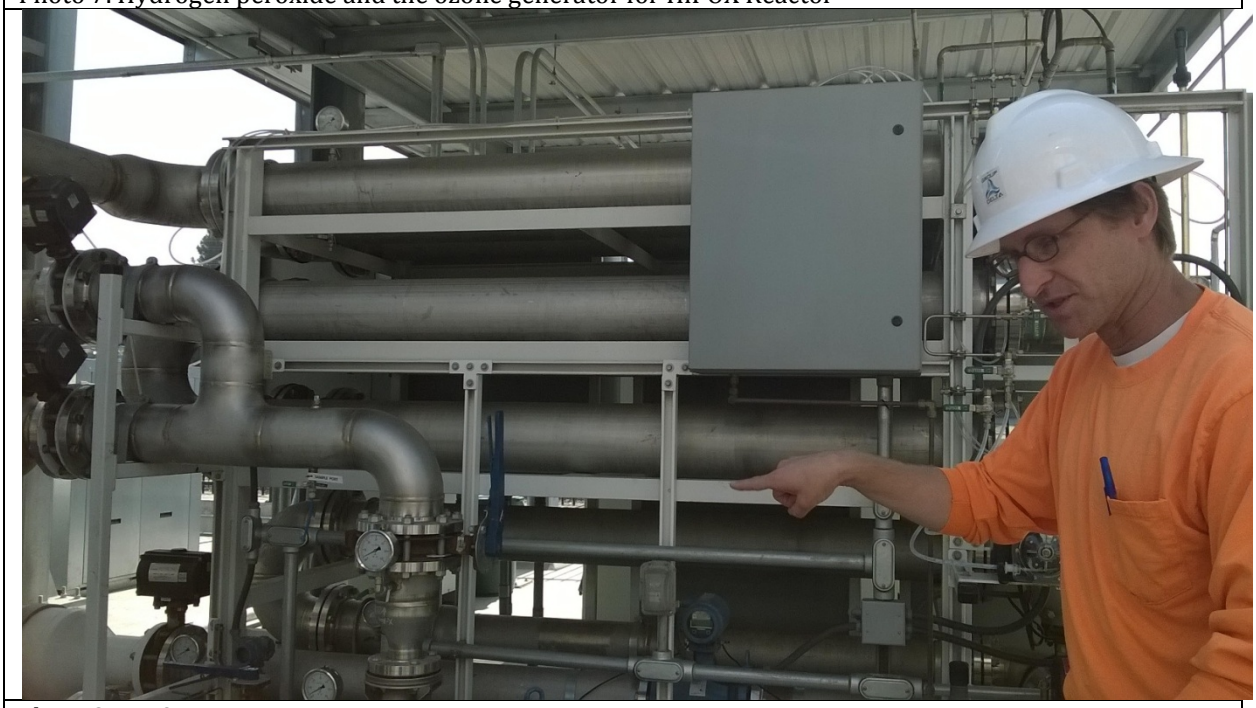

Photo 8. HiPOX Reactor

Photo 9. Sequesterant and defoaming agents to prevent fouling and foaming in the air strippers.

Photo 10. Bag filters before the air strippers.

Photo 11. Air Strippers

Photo 12. Acid to drop the pH of the treated water prior to the LGAC system

Photo 13. Vapor Granular Activated Carbon Vessels.

Photo 14. Stack

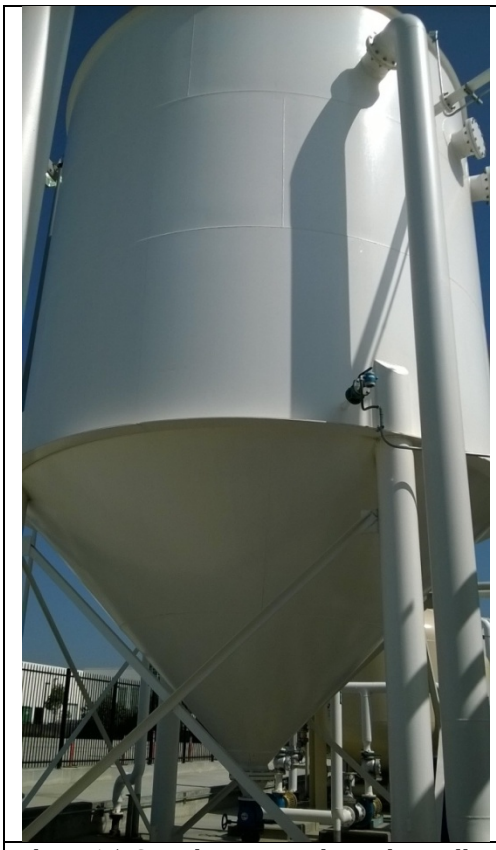

Photo 15. Cone bottom tank used to collect process water which is pumped to first equalization tank at the beginning of the process.

Photo 16. Liquid Granular Activated Carbon Vessels

Photo 17. Bag filters before effluent tank

Photo 18. Effluent tank

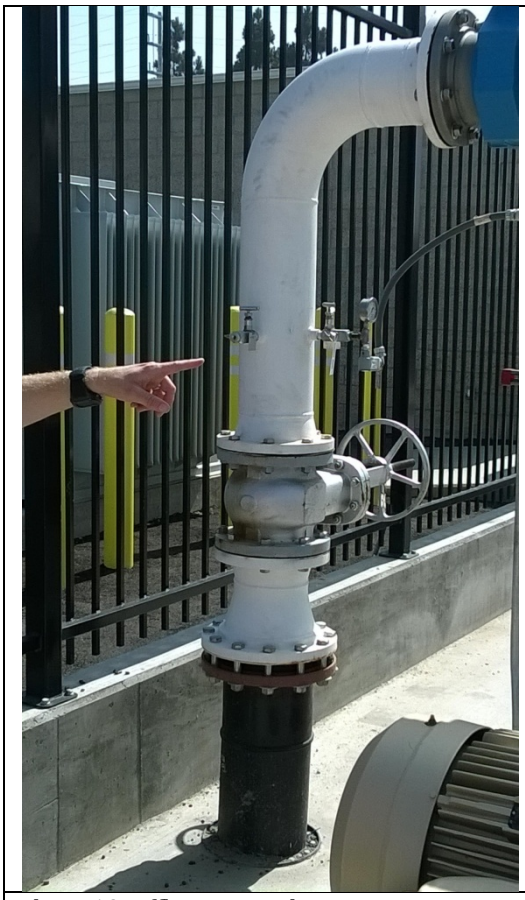

Photo 19. Effluent sample port

Photo 20. Montose property fencing

Photo 22. Extraction well, EW5.

Site Inspection Checklist

Five-Year Review Site Inspection Checklist

I. SITE INFORMATION

Site name: Montrose/Del Amo OU3 Dual Site Groundwater	**Date of inspection:** 06/19/2015
Location: Los Angeles, CA	**EPA ID:** CAD008242711, CAD029544731
Agency, office, or company leading the five-year review: EPA	**Weather/temperature** clear, sunny, low-mid 80s

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ■ Access controls
- ■ Institutional controls
- ■ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Other: *e.g. Groundwater monitoring*
- ■ Monitored natural attenuation
- ■ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Mike Palmer (Name) Prroject Coordinator (Title) 6/19/2015 (Date)
   Interviewed ■ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ■ Report attached see appropriate appendix

2. **O&M staff** _____ (Name) _____ (Title) _____ (Date)
   Interviewed ☐ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ■ Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

4. **Other interviews** (optional) ☐ Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

■ O&M manual	■ Readily available	■ Up to date	☐ N/A
■ As-built drawings	■ Readily available	■ Up to date	☐ N/A
☐ Maintenance logs	☐ Readily available	☐ Up to date	■ N/A

Remarks Equipment shakedown logs are available and up to date

2. **Site-Specific Health and Safety Plan** ■ Readily available ■ Up to date ☐ N/A
■ Contingency plan/emergency response plan ■ Readily available ■ Up to date ☐ N/A
Remarks

3.	**O&M and OSHA Training Records**	☐ Readily available	■ Up to date	☐ N/A
	Remarks kept at the offices of the respective contractors			
4.	**Permits and Service Agreements**			
	☐ Air discharge permit	☐ Readily available	☐ Up to date	■ N/A
	☐ Effluent discharge	☐ Readily available	☐ Up to date	■ N/A
	☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	■ N/A
	☐ Other permits NPDES	■ Readily available	■ Up to date	☐ N/A
	Remarks There has been no discharge, though.			
5.	**Gas Generation Records**	☐ Readily available	☐ Up to date	■ N/A
	Remarks			
6.	**Settlement Monument Records**	☐ Readily available	☐ Up to date	■ N/A
	Remarks			
7.	**Groundwater Monitoring Records**	■ Readily available	■ Up to date	☐ N/A
	Remarks			
8.	**Leachate Extraction Records**	■ Readily available	■ Up to date	☐ N/A
	Remarks			
9.	**Discharge Compliance Records**			
	☐ Air	☐ Readily available	☐ Up to date	☐ N/A
	☐ Water (effluent)	☐ Readily available	☐ Up to date	■ N/A
	Remarks			
10.	**Daily Access/Security Logs**	■ Readily available	■ Up to date	☐ N/A
	Remarks			

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house ☐ Contractor for State
☐ PRP in-house ■ Contractor for PRP
☐ Federal Facility in-house ☐ Contractor for Federal Facility
■ Other O&M has not started yet, so this section does not apply.

2. **O&M Cost Records**

☐ Readily available ☐ Up to date ☐ Funding mechanism/agreement in place
Original O&M cost estimate_____ ☐ Breakdown attached

Total annual cost by year for review period if available

From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons:

O&M has not started. Plant construction was just completed. Functional testing and equipment shakedowns are in progress.

V. ACCESS AND INSTITUTIONAL CONTROLS ■ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ■ Gates secured ☐ N/A

Remarks Fencing is in good condition, looks new.

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ■ N/A

Remarks Signs on facility fences, barbed wire on top of fences, motion sensors, and security cameras.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ■ No ☐ N/A
Site conditions imply ICs not being fully enforced ☐ Yes ■ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) _____
Frequency _____
Responsible party/agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.

Reporting is up-to-date ☐ Yes ☐ No ☐ N/A
Reports are verified by the lead agency ☐ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☐ Yes ☐ No ☐ N/A
Violations have been reported ☐ Yes ☐ No ☐ N/A
Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☐ ICs are adequate ☐ ICs are inadequate ☐ N/A
Remarks

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☐ No vandalism evident
Remarks Vandalism/trespassing has not been an issue at the plant since implementation of security system. Some electrical panels in the neighborhood have been vandalized.

2. **Land use changes on site** ■ N/A
Remarks

3. **Land use changes off site** ■ N/A
Remarks

VI. GENERAL SITE CONDITIONS

A. Roads ■ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☐ Roads adequate ☐ N/A
Remarks Parts of the road immediately east of the treatment plant (Normandie Avenue) were torn up to facilitate installation of extraction pipeline. The parts of the road that were torn up were replaced, but are in poor condition. Normandie Avenue in this area is generally in poor condition. The poor condition may be related to heavy truck traffic in the area. Otherwise, roads are adequate.

B. Other Site Conditions

Remarks

VII. LANDFILL COVERS ☐ Applicable ■ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ Settlement not evident
   Areal extent_____ Depth_____
   Remarks

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent_____ Depth_____
   Remarks

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
   Areal extent_____ Depth_____
   Remarks

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established
   ☐ No signs of stress ☐ Trees/Shrubs (indicate size and locations on a diagram)
   Remarks

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
   Remarks

7. **Bulges** ☐ Location shown on site map ☐ Bulges not evident
   Areal extent_____ Height_____
   Remarks

8. **Wet Areas/Water Damage** ☐ Wet areas/water damage not evident
- ☐ Wet areas ☐ Location shown on site map Areal extent_____
- ☐ Ponding ☐ Location shown on site map Areal extent_____
- ☐ Seeps ☐ Location shown on site map Areal extent_____
- ☐ Soft subgrade ☐ Location shown on site map Areal extent_____

Remarks

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☐ No evidence of slope instability
Areal extent_____
Remarks

B. Benches ☐ N/A ☐ Applicable

(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☐ N/A or okay
Remarks

2. **Bench Breached** ☐ Location shown on site map ☐ N/A or okay
Remarks

3. **Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay
Remarks

C. Letdown Channels ☐ Applicable ☐ N/A

(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on site map ☐ No evidence of settlement
Areal extent_____ Depth_____
Remarks

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
Material type_____ Areal extent_____
Remarks

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
Areal extent_____ Depth_____
Remarks

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
Areal extent_____ Depth_____
Remarks

5. **Obstructions** Type_____ ☐ No obstructions ☐ Location shown on site map
Areal extent_____ Size_____
Remarks

6. **Excessive Vegetative Growth** Type_____
☐ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent_____
Remarks

D. Cover Penetrations ☐ Applicable ☐ N/A

1. **Gas Vents** ☐ N/A ☐ Active ☐ Passive ☐ Properly secured/locked ☐ Functioning
☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration
Remarks

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks

3. **Monitoring Wells** (within surface area of landfill)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks

4. **Leachate Extraction Wells**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A
Remarks

E. Gas Collection and Treatment ☐ Applicable ☐ N/A

1. **Gas Treatment Facilities**
   ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
   ☐ Good condition ☐ Needs Maintenance
   Remarks

2. **Gas Collection Wells, Manifolds and Piping**
   ☐ Good condition ☐ Needs Maintenance
   Remarks

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   ☐ Good condition ☐ Needs Maintenance ☐ N/A
   Remarks

F. Cover Drainage Layer ☐ Applicable ☐ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A
   Remarks

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A
   Remarks

G. Detention/Sedimentation Ponds ■ Applicable ☐ N/A

1. **Siltation** ☐ N/A ☐ Siltation not evident
   Areal extent_____ Depth_____
   Remarks

2. **Erosion** Areal extent_____ Depth_____ ☐ Erosion not evident
   Remarks

3. **Outlet Works** ☐ Functioning ☐ N/A
   Remarks

4. **Dam** ☐ Functioning ☐ N/A
   Remarks

H. Retaining Walls ☐ Applicable ☐ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks

2. **Degradation** ☒ Location shown on site map ☐ Degradation not evident
   Remarks

I. Perimeter Ditches/Off-Site Discharge ☒ Applicable ☒ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
   Areal extent_____ Depth_____
   Remarks

2. **Vegetative Growth** ☐ Location shown on site map ☒ N/A
   ☐ Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent_____ Depth_____
   Remarks

4. **Discharge Structure** ☐ Functioning ☐ N/A
   Remarks

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
   Areal extent_____ Depth_____
   Remarks

2. **Performance Monitoring** Type of monitoring_____
   ☐ Performance not monitored ☐ Evidence of breaching
   Frequency_____ Head differential_____
   Remarks

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☐ N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   ■ Good condition ☐ All required wells properly operating ☐ Needs Maintenance ☐ N/A
   Remarks The system has yet to start operating, so the wells were not operational during the site visit. The wellhead plumbing looked to be in good condition, though.

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☑ Good condition ☐ Needs Maintenance
Remarks

3. **Spare Parts and Equipment**
☑ Readily available ☑ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☑ N/A

1. **Collection Structures, Pumps, and Electrical**
☐ Good condition ☐ Needs Maintenance
Remarks

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☐ Good condition ☐ Needs Maintenance
Remarks

3. **Spare Parts and Equipment**
☐ Readily available ☐ Good condition ☑ Requires upgrade ☐ Needs to be provided
Remarks

C. Treatment System ☑ Applicable ☐ N/A

1. **Treatment Train** (Check components that apply)
☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
☑ Air stripping ☑ Carbon adsorbers
☑ Filters Bag filters
☐ Additive (*e.g.*, chelation agent, flocculent) sequestering and defoaming agents, hydrochloric acid
☐ Others advanced oxidation process (ozone and hydrogen peroxide)
☑ Good condition ☐ Needs Maintenance
☑ Sampling ports properly marked and functional
☐ Sampling/maintenance log displayed and up to date
☑ Equipment properly identified
☐ Quantity of groundwater treated annually_____
☐ Quantity of surface water treated annually_____
Remarks All equipment looks new and is clearly labeled.

2. **Electrical Enclosures and Panels** (properly rated and functional)
☐ N/A ☐ Good condition ☐ Needs Maintenance
Remarks Good condition, looks new.

3. **Tanks, Vaults, Storage Vessels**
☐ N/A ■ Good condition ■ Proper secondary containment ☐ Needs Maintenance
Remarks All units and piping are clearly labeled.

4. **Discharge Structure and Appurtenances**
☐ N/A ■ Good condition ☐ Needs Maintenance
Remarks

5. **Treatment Building(s)**
☐ N/A ■ Good condition (esp. roof and doorways) ☐ Needs repair
■ Chemicals and equipment properly stored
Remarks

6. **Monitoring Wells** (pump and treatment remedy)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ All required wells located ☐ Needs Maintenance ☐ N/A
Remarks Monitoring wells were not visited during the site visit.

D. Monitoring Data

1. Monitoring Data
■ Is routinely submitted on time ■ Is of acceptable quality

2. Monitoring data suggests:
☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ All required wells located ☐ Needs Maintenance ☐ N/A
Remarks Monitoring wells were not visited during the site visit.

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The extraction and treatment system has not yet been started up.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

The O&M phase has not yet begun.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

The O&M phase has not yet begun. So far, nothing unexpected has occurred in regard to the functional testing and equipment shakedowns.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

It is too early to assess opportunities for optimization; this will be a part of future activities once the plant is running.

Appendix E: Fact Sheet

.

[This page is intentionally blank]

Sitio Superfund Del Amo Superfund Site

U.S. Environmental Protection Agency • Region 9 • San Francisco, CA • June / Junio 2015

FIVE-YEAR REVIEW FOR DEL AMO SUPERFUND SITE

The United States Environmental Protection Agency (EPA) conducts regular evaluations of certain Superfund site cleanup remedies to determine if a cleanup is, or will be, protective of human health and the environment. These types of evaluations are called Five-Year Reviews (FYRs). If EPA's cleanup remedy leaves contaminated materials on site at levels that restrict the property's use, or if the cleanup remedy takes longer than five years to complete, the Superfund law requires a FYR to be conducted.

REVISIÓN DE CINCO AÑOS PARA EL SITIO DEL AMO SUPERFONDO

La Agencia de Protección Ambiental de los EE.UU. (EPA, por sus siglas en inglés) lleva a cabo evaluaciones regulares de remedios de limpieza de sitios Superfund para determinar si una limpieza protege, o protegerá, la salud humana y el medio ambiente. Estas evaluaciones se llaman Revisiones de Cinco Años (FYR). Si el remedio de limpieza de la EPA deja materiales contaminados en su lugar en niveles que limitan el uso de la propiedad, o si el remedio de limpieza tarda más que cinco años en completarse, la ley Superfund requiere que se realice una FYR.

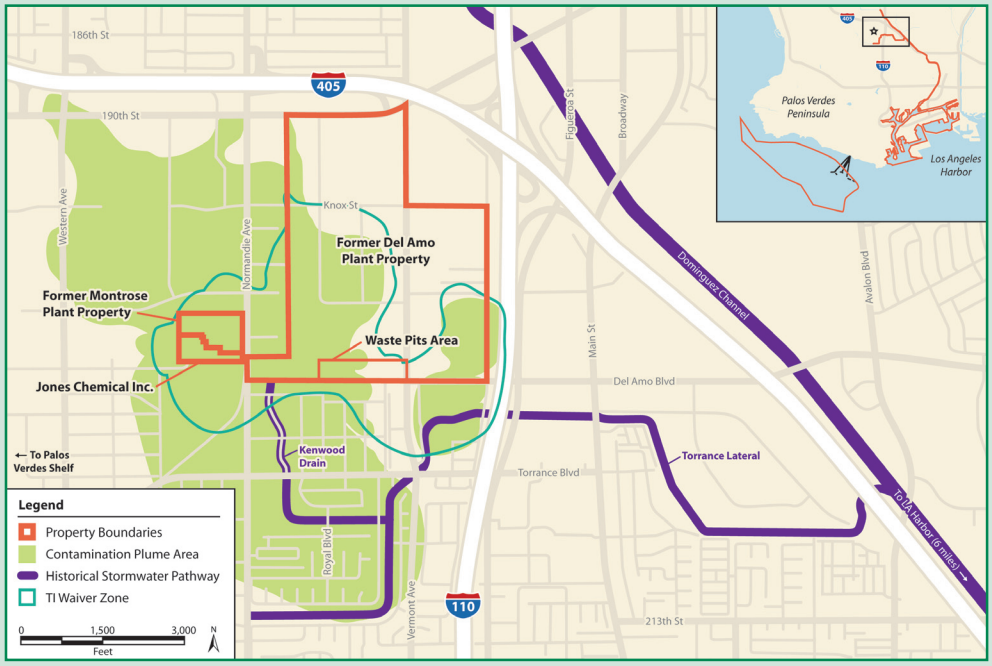

Figure 1
The Del Amo and Montrose Chemical Superfund Sites

Figura 1
Sitios Superfund Del Amo y Montrose

EPA has begun the third FYR of the cleanup remedy at the Del Amo Superfund Site located in Los Angeles, CA.

A Superfund cleanup remedy is a long-term action that removes or substantially reduces hazardous substances in the environment.

La EPA ha comenzado la tercera FYR del remedio de limpieza para el Sitio Superfund Del Amo, ubicado en Los Ángeles, CA.

Un remedio de limpieza Superfund es una acción a largo plazo que elimina o reduce sustancialmente sustancias peligrosas en el medioambiente.

What is the purpose of a Five Year Review (FYR)?

During a FYR, EPA evaluates the cleanup remedy in order to determine if it is currently, or upon completion, will be protective of human health and the environment. For the Del Amo FYR, the United States Army Corps of Engineers will provide assistance to EPA in conducting the review.

During the FYR, we will

- Inspect the site;
- Review site documents and data;
- Identify any new information that could affect the protectiveness of the Superfund cleanup remedy; and
- Seek input from partner agencies and interested community stakeholders.

To determine whether a remedy is protective, we answer three key questions for the FYR:

- Is the remedy functioning as intended by the decision documents?
- Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy selection still valid?
- Has other information come to light that could call into question the protectiveness of the remedy?

¿Cuál es el propósito de una Revisión de Cinco Años (FYR)?

Durante una FYR la EPA evalúa el remedio de limpieza con el fin de determinar si protege, o protegerá, la salud humana y el medio ambiente. Para la FYR de Del Amo, el Cuerpo de Ingenieros del Ejército de los Estados Unidos proveerá asistencia a la EPA para conducir la revisión.

Durante la FYR, haremos

- Inspección del sitio;
- Revisión de documentos y datos del sitio;
- Identificar cualquier información nueva pueda afectar el nivel de protección de la limpieza; y
- Busca contribuciones de agencias y de miembros interesados de la comunidad.

Para determinar si un remedio sigue protegiendo la salud y el medioambiente, estaremos respondiendo a tres preguntas claves:

- ¿Está funcionando el remedio según lo previsto por los documentos de decisión?
- ¿Siguen siendo válidos los supuestos de exposición, los datos de toxicidad, los niveles de limpieza, y los objetivos de acción correctiva utilizados en la selección del remedio?
- ¿Ha salido a la luz otra información que podría poner en duda la protección ofrecida por el remedio?

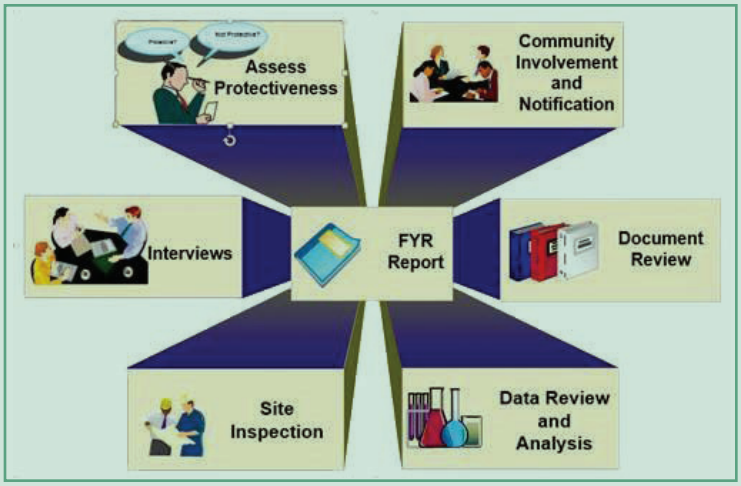

Figure 2
Five Year Review Process

Figura 2
El proceso de la Revisión de Cinco Años

At the conclusion of this process, a Five-Year Review report is produced. This report documents the review and concludes whether the remedies are working as intended or are expected to work as intended to protect human health and the environment.

A final report for the Del Amo Superfund Site is expected in October 2015. EPA will place the report in the local information repositories and post it on EPA's Del Amo website alongside the previous FYRs issued in 2005 and 2010, and on EPA's Montrose website for OU3, dual site groundwater.

What do we know about the site and the cleanup activities?

The Del Amo Superfund Site, located in Los Angeles, CA, is approximately 280 acres in a narrow strip of the city known as the Harbor Gateway neighborhood. The Del Amo Site was the location of a synthetic rubber plant which operated from 1943 to 1972. The Site is divided into three operable units (OUs): OU1, soil and non-aqueous phase liquids (NAPL); OU2, waste pits area; and OU3, dual site groundwater. OU3 dual site groundwater incorporates the co-mingled groundwater contaminants from both Del Amo and neighboring Montrose Superfund Sites. EPA has selected cleanup remedies for all three OUs (see Table 2, "Selected Cleanup Remedies," at the end of this factsheet).

During the operation of the rubber plant, sludge and liquid waste was placed in unlined waste pits and evaporation ponds for disposal. These unlined waste pits and evaporation ponds are referred to as the "waste pits area," or OU2.

Environmental investigations showed that the waste material had contaminated the surrounding soil and groundwater. The main chemicals of concern today are benzene and naphthalene, although other volatile organic compounds and semi-volatile compounds are present (see Table 1, "Primary Site-Related Contaminants"). The pesticide DDT and other chemicals related to its manufacture are also present as a result of activities at the neighboring Montrose Superfund Site.

In 2005 and 2010, EPA issued FYRs for the waste pits area (OU2) of the Del Amo Superfund Site. Both FYRs concluded that the remedy was protective of human health and the environment. For 2015, one FYR will be prepared for OU1 and OU2, and a second FYR will be prepared for OU3.

Al término de este proceso, se producirá un informe FYR. El informe documenta la revisión y concluye si los remedios están funcionando según lo previsto para proteger la salud humana y el medioambiente.

Se espera un informe final para el sitio Superfund Del Amo en octubre de 2015. La EPA pondrá el informe en los depósitos de información locales y lo publicará en el sitio web de la EPA para Del Amo al lado de los FYR anteriores de 2005 y 2010, y en el sitio web de la EPA para Montrose por el agua subterránea de ambos sitios.

¿Qué sabemos acerca del sitio y las actividades de limpieza?

El sitio Superfund Del Amo, ubicado en Los Ángeles, CA, consiste de aproximadamente 280 hectáreas en una zona angosta de la ciudad conocida como la vecindad Harbor Gateway. Del Amo fue sitio de una fábrica de caucho sintético que funcionó desde 1943 hasta 1972. El sitio Del Amo se divide en tres unidades operativas (UO): suelo UO1 y líquidos en fase no acuosa (NAPL); zona de piscinas de desechos UO2; y sitio de agua subterránea dual UO3. El sitio de agua subterránea dual UO3 incorpora los contaminantes del agua subterránea mezclado de ambos Sitios Superfund Del Amo y Montrose. La EPA ha seleccionado remedios de limpieza por todos los tres UOs (vea la Tabla 2, "Remedios de Limpieza Seleccionados" al final de esta hoja de información).

Durante la operación de la fábrica de caucho sintético, lodos residuales y desechos líquidos en pozos de desechos sin revestimiento y en estanques de evaporación para su eliminación. Hoy, se refiere a esta zona como el "área de los pozos de deshechos," o UO2.

Las investigaciones ambientales mostraron que los desechos habían contaminado el suelo y el agua subterránea en el área. Los químicos de interés principales hoy en día son benceno y naftaleno, aunque otros compuestos orgánicos volátiles y compuestos semi-volátiles están presentes (vea Tabla 1, "Contaminantes Principales Relacionados con el Sitio.") El pesticida DDT y otros químicos relacionados con su fabricación también están presentes como resultado de las actividades en el sitio Superfund cercano llamado Montrose.

En el 2005 y el 2010, la EPA produjo FYRs para el área de los pozos de deshechos (UO2) del sitio Del Amo. Ambas revisiones concluyeron que el remedio protege la salud humana

For more information on the protectiveness conclusions of these FYRs, please visit the Del Amo Site webpage. A link to this webpage is found at the end of this factsheet.

Table 1
Primary Site-Related Contaminants

Operable Unit (OU)	Primary Site-Related Contaminants
OU1 – Soil and non-aqueous phase liquids (NAPL)	Arsenic, Benzene, Benzo(b) fluoranthene, Benzo(a) pyrene, Copper, 4,4-DDT, indeno(1,2,3-cd)pyrene, n-Nitrosodiphenylam-ine, Perchloroethylene (PCE), i-Propyltoluene, Trichloroethylene (TCE)
OU2 – Waste pits area	Benzene, Naphthalene
OU3 – Dual site ground water (includes Del Amo OU3 and Montrose Superfund Site OU3)	Benzene, Chlorobenzene, Parachlorobenzene Sulfonic Acid (pCBSA), PCE, TCE

What is happening with the groundwater treatment system?

The Torrance groundwater extraction and treatment system —located on South Normandie Avenue near the intersection of West 204th Street—is one component of the remedy for OU3 (see Table 2, "Selected Cleanup Remedies," for all remedy components). The goal of the treatment system is to prevent contaminated groundwater from spreading and to reduce the overall amount of contamination. The design for the treatment system was completed in September 2012, and construction was completed in December 2014.

Currently, the start-up and commissioning of the treatment system—the process of turning on the system and ensuring all equipment installed is correctly functioning—is being conducted under EPA oversight.

y el medio ambiente.

Para más información sobre las conclusiones de protección de estas revisiones, por favor visita el sitio web de Del Amo. El enlace se encuentra el final de esta hoja.

Tabla 1
Contaminantes Principales Relacionados con el Sitio

Unidad Operable (UO)	Contaminantes Principales Relacionados con el Sitio
UO1 - suelo y líquidos en fase no acuosa (NAPL)	Arsénico, Benceno, benzo[b]fluoranteno, benzo[a]pireno, cobre, 4,4-DDT, indeno[1,2,3-c,d] pireno, n-nitrosodifenil-amina, i-propiltolueno, tetracloroetileno (PCE), tricloroetileno (TCE)
UO2 – Área de los Pozos de Deshechos	Benceno, Naftalina
OU3 – Agua Subterránea de Ambos Sitios (UO3 Del Amo y UO3 Montrose)	Benceno, Clorobenceno, para-Clorobenceno Ácido Sulfónico (pCBSA), PCE y TCE

¿Qué está sucediendo con el sistema de tratamiento del agua subterránea?

El sistema de extracción y tratamiento de agua subterránea – localizado en S. Normandie Ave. cerca del cruce de la calle West 204th St. – es una de las piezas del remedio para la UO3 (vea Tabla 2, "Remedios de Limpieza Seleccionados," para todos los componentes de esta limpieza). El objetivo del sistema de tratamiento es evitar que el agua subterránea contaminada se propague y reducir la cantidad total de contaminación. El diseño para el sistema de tratamiento se finalizó en septiembre de 2012, y la construcción se completó en diciembre de 2014.

Actualmente, el inicio y encargo del sistema de tratamiento – el proceso de prender el sistema y asegurarse de que todos los equipos instalados están funcionando correctamente – se está llevando a cabo bajo la supervisión de la EPA.

What happens after the FYR?

After the FYR report is completed, EPA will place the report in the local information repositories and post it on EPA's website. If the FYR determines that cleanup goals are not being met, or identifies issues that affect current or future protectiveness, then EPA will evaluate such issues further to determine next steps.

How can the community be involved?

EPA is interested in hearing from the public. In many circumstances, the public has information critical to evaluate the protectiveness of a cleanup remedy. For the Del Amo Superfund Site, the public may have helpful information on all three OUs. Community members can provide feedback in a variety of ways. You can call, mail, or email any comments or concerns. In addition, you can participate in a phone interview. All written or verbal comments from individual community members will be part of the public record.

Here are some examples of helpful information that could be provided by community stakeholders:

- Broken fences, unusual odors, dead plants, materials leaving the Site, or other problems;
- Buildings, residential properties, or land around the Site being used in new ways;
- Any unusual activities at the site, such as dumping, vandalism, or trespassing; and
- Ways the cleanup at the Site has affected the neighborhood.

If you would like to be interviewed, have any concerns regarding the Site, or would like to receive future information, please contact a member of the team:

- **Dante Rodriguez**, Remedial Project Manager for Del Amo (OU1/OU2), at (415) 972-3166, or by email at: rodriguez.dante@epa.gov
- **Ray Chavira**, Remedial Project Manager for Montrose/Del Amo dual site groundwater (OU3), at (415) 947-4218, or by email at: chavira.raymond@epa.gov
- **Yolanda Sanchez**, Community Involvement Coordinator, at (415) 972-3880, or by email at: sanchez.yolanda@epa.gov

¿Qué sucede después de la FYR?

Una vez se finalizó el informe para la FYR, la EPA colocará el informe en los depósitos de información locales y lo publicará en el sitio web de la EPA. Si la FYR determina que las metas de limpieza no se están cumpliendo o identifica cuestiones que afectan la protección actualmente o en el futuro, se evaluarán las cuestiones más a fondo para determinar los próximos pasos.

¿Cómo puede participar la comunidad?

La EPA está interesada en la participación de la comunidad. En muchos casos, el público tiene información crucial para evaluar la eficacia de un remedio de limpieza. Para el Sitio Superfund Del Amo, el público podrá tener información útil en todas las UOs. Miembros de la comunidad podrán proveer comentarios en una variedad de maneras. Podrás llamar, mandar correo postal, o correo electrónico para entregar tus cometarios o preocupaciones. También podrías participar en una entrevista por teléfono. Todos los comentarios escritos o verbales de individuos de la comunidad serán parte del registro público.

Estos son algunos ejemplos de información importante que podrá proveer un miembro de la comunidad:

- cercas rotas, olores inusuales, plantas muertas, materiales saliendo del sitio, u otros problemas;
- edificios, terrenos, o residencias alrededor del sitio que se están utilizando en nuevas formas;
- actividades inusuales en el sitio, como tirando basura, vandalismo, o allanamiento; y
- información sobre cómo la limpieza en este sitio ha afectado a la vecindad.

Si a usted le gustaría hacer una entrevista, tiene preguntas acerca del sitio, o desea recibir más información, por favor póngase en contacto con un miembro del equipo:

- **Dante Rodríguez**, (En Español) Gerente del Proyecto de Remediación de Del Amo (OU1 / UO2), a (415) 972-3166 o por correo electrónico a: rodriguez.dante@epa.gov
- **Ray Chavira**, Gerente del Proyecto de Remediación del sitio dual de agua subterránea Montrose / Del Amo (UO3), a (415) 947-4218, o por correo electrónico a: chavira.raymond@epa.gov
- **Yolanda Sánchez**, Coordinadora de Participación Co munitaria, a (415) 972-3880, o por correo electrónico a: sanchez.yolanda@epa.gov

Please visit one of the site's information repositories for additional information:

Carson Public Library
151 East Carson Street
Carson, CA 90745
(310) 830-0901

Torrance Civic Center Library
3301 Torrance Boulevard
Torrance, CA 90503
(310) 618-5959

Superfund Records Center
Mail Stop SFD-7C
95 Hawthorne St., Room 403
San Francisco, CA 94105
(415) 536-2000

More information will be published on the EPA Del Amo www.epa.gov/region09/delamo or Montrose www.epa.gov/region09/montrose Site websites.

Por favor, visite uno de los repositorios de información del sitio para obtener información adicional:

Biblioteca Publica Carson
151 East Carson Street
Carson, CA 90745
(310) 830-0901

Biblioteca del Centro Cívico de Torrance
3301 Torrance Boulevard
Torrance, CA 90503
(310) 618-5959

Centro de Registros Superfund
Mail Stop SFD-7C
95 Hawthorne St., Room 403
San Francisco, CA 94105
(415) 536-2000

Más información será publicada en los sitios web de la EPA para Del Amo (www.epa.gov/region09/delamo) y Montrose (www.epa.gov/region09/montrose).

Table 2: "Selected Cleanup Remedies"

Operable Unit	Environmental Media	Record of Decision (ROD) signed in	Components of the Remedy
OU1	Soil and non-aqueous phase liquids (NAPL)	September 30, 2011	• Institutional controls (ICs): informational outreach; building permit review; General Plan footnote, and restrictive covenants (Status: In place) • Capping for impacted shallow outdoor soils in four areas (Status: Under design) • Building engineering controls (BECs) for VOC-impacted, shallow soil under the building in one area (Status: Under design) • Soil vapor extraction (SVE) for VOC-impacted, shallow outdoor soil in three areas (Status: Under design) • Soil vapor extraction (SVE) for VOC-impacted, shallow soil under the building in one area (different than the BECs above) (Status: Under design) • In-situ chemical oxidation (ISCO) and SVE for deep soil and groundwater in NAPL-impacted groundwater in three areas (Status: Under design) • For areas of contamination encountered in the future during redevelopment and construction: excavation or BECs, capping, or SVE, and Restrictive Covenants. (Status: Under design)
OU2	Waste pits area	September 5, 1997	• Institutional control (IC): deed restrictions (Status: In place) • A Resource Conservation and Recovery Act (RCRA) cap (Status: In place) • Surface water controls (Status: In place) • Soil vapor extraction (SVE) with in-situ bioventing (Status: In place) • Security fencing (Status: In place)
OU3	Dual site groundwater (includes Montrose Superfund Site OU3)	March 30, 1999	• Containment and isolation of non-aqueous phase liquid (NAPL) (Status: pending) • Groundwater extraction, treatment, and reinjection of treated water (Status: pending) • Technical impracticability (TI) waiver (Status: In place) • Groundwater monitoring (Status: In place)

Tabla 2: "Remedios de Limpieza Seleccionados"

Unidad Operable	Materiales Ambientales Afectados:	El Registro de Decisión (ROD) fue firmado:	Componentes del Remedio
OU1	Suelo y líquidos en fase no acuosa (NAPL)	30 de Septiembre, 2011	• Controles Institucionales (CI): el compartir de información; revisión de permisos de construcción, nota en el Plan General, y cláusulas contráctales restrictivas (Estado: Activo) • Capa para suelos exteriores superficiales afectadas en cuatro áreas (Estado: Bajo diseño) • Controles de ingeniería del edificio (BECs) para suelo poco profundo impacto por VOCs, bajo el edificio en un área (Estado: Bajo diseño) • Extracción de vapores del suelo (SVE) para el suelo poco profundo impactado por VOCs en el aire libre, en tres áreas (Estado: Bajo diseño) • Extracción de vapores del suelo (SVE) en el suelo poco profundo impactado por VOCs, bajo el edificio en un área (diferente a las BECs arriba) (Estado: Bajo diseño) • Oxidación química en sitio (ISCO) y SVE para el suelo y las aguas subterráneas profundas en el agua subterránea impactada por NAPL en tres áreas (Estado: Bajo diseño) • Para las áreas de contaminación encontradas en el futuro durante la remodelación y construcción: excavación o BEC, tapado, o SVE, y Convenios restrictivos (Estado: Bajo diseño)
OU2	Área de piscinas de desechos	5 de Septiembre, 1997	• Control Institucional (IC): Cláusula Contractual Restrictiva (Estado: Activo) • Capa de Ley de Conservación y Recuperación de Recursos (RCRA) (Estado: Activo) • Controles de agua superficial (Estado: Activo) • Extracción de vapores del suelo (SVE) con bio-ventilación en sitio (Estado: Activo) • Cerca de Seguridad (Estado: Activo)
OU3	Aguas subterráneas de los sitios duales	30 de Marzo, 1999	• La contención y aislamiento de líquidos en fase no acuosa (NAPL) (Estado: Pendiente) • Extracción de aguas subterráneas, tratamiento y re-inyección de agua tratada (Estado: Pendiente) • Renuncia de imposibilidad técnica (TI) (Estado: Activo) • Monitoreo de Aguas Subterráneas (Estado: Activo)

EPA Sitio Superfund Del Amo Superfund Site

For More Information

For more information, or to be added to the site mailing list, please contact:

EPA contacts:

Dante Rodriguez
Remedial Project Manager for Del Amo (OU1/OU2)
(415) 972-3166
rodriguez.dante@epa.gov

Ray Chavira
Remedial Project Manager for Montrose/Del Amo dual site groundwater (OU3),
(415) 947-4218
chavira.raymond@epa.gov

Yolanda Sanchez
Community Involvement Coordinator
(415) 972-3880
sanchez.yolanda@epa.gov

EPA contactos:

Dante Rodríguez
Gerente del Proyecto de Remediación de Del Amo (OU1 / UO2)
(415) 972–3166
rodriguez.dante@epa.gov

Ray Chavira
Gerente del Proyecto de Remediación del sitio dual de agua subterránea Montrose / Del Amo (UO3)
(415) 947–4218
chavira.raymond@epa.gov

Yolanda Sánchez
Coordinadora de Participación Co munitaria
(415) 972-3880
sanchez.yolanda@epa.gov

Official Business
Penalty for Private Use, $300

Address Service Requested

United States Environmental Protection Agency, Region 9
75 Hawthorne Street (SFD-6-3)
San Francisco, CA 94105
Attn: Yolanda Sanchez (Del Amo 6/15)

FIRST-CLASS MAIL
POSTAGE & FEES
PAID
U.S. EPA
Permit No. G-35

Appendix F: EPA pCBSA Review

.

[This page is intentionally blank]

Superfund Technical Support Center

National Center for Environmental Assessment
U.S. Environmental Protection Agency
26 West Martin Luther King Drive, MS-AG41
Cincinnati, Ohio 45268

Jay Zhao/Director, Phillip Kaiser/Hotline Director, Teresa Shannon/Administrator
Hotline 513-569-7300, FAX 513-569-7159, E-Mail: Superfund_STSC@epa.gov

August 17, 2015

Daniel Stralka
Requestor Affiliation or Site

ASSISTANCE REQUESTED: Development of a new PPRTV assessment for p-chlorobenzene sulfonic acid.

ENCLOSED INFORMATION: Attachment 1: pCBSA review_final.pdf

If you have any questions regarding this transmission, please contact the STSC at (513) 569-7300.

Attachments (1)

cc:

Supported by Highlight Technologies, LLC, under
U.S. Environmental Protection Agency Contract No. EP-C-13-007

NCEA's STSC has explored the feasibility of developing screening provisional reference values for p-chlorobenzene sulfonic acid using its published tiered surrogate approach (Wang et al., 2012). Unfortunately, based on the published methodology, there were no viable surrogate chemicals identified from which to derive provisional screening reference values. Thus, the STSC does not currently plan to move forward with developing a new PPRTV assessment for p-chlorobenzene sulfonic acid.

REFERENCES

Wang, NC; Zhao, QJ; Wesselkamper, SC; Lambert, JC; Petersen, D; Hess-Wilson, JK. (2012). Application of computational toxicological approaches in human health risk assessment. I. A tiered surrogate approach. Regul Toxicol Pharmacol 63: 10-19. http://dx.doi.org/10.1016/j.yrtph.2012.02.006